THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXVI. No. 900.] LONDON, AUGUST 10, 1880. [32ND YEAR. Price 6d.

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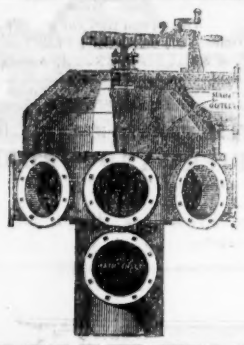
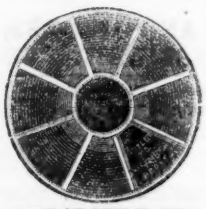
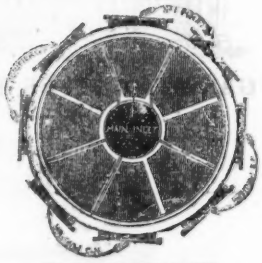


ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

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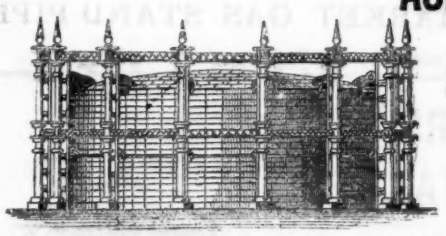

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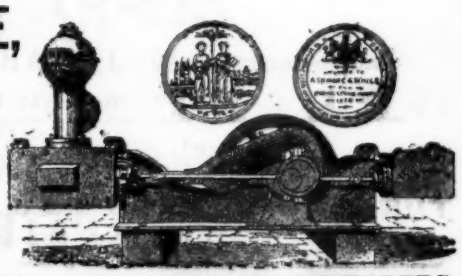

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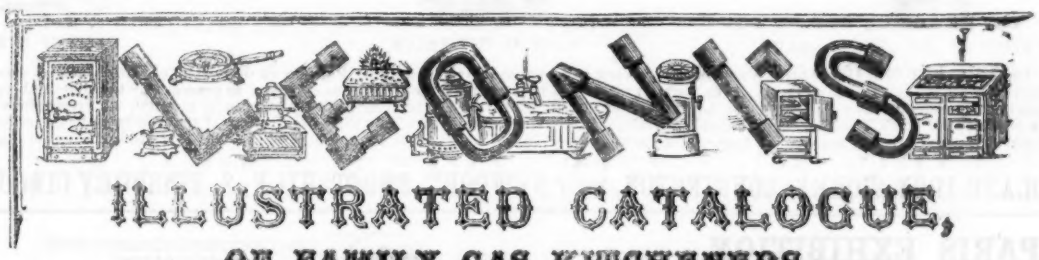
No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.



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TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.
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TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

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ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR
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And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

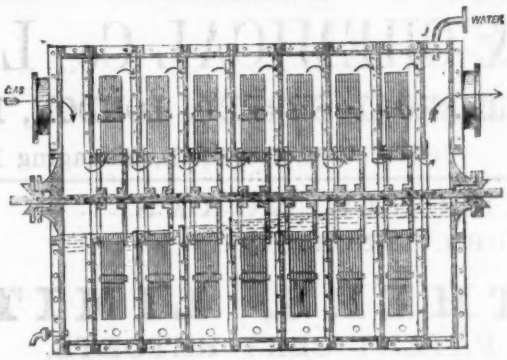
The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*
The advantages attending its use are—

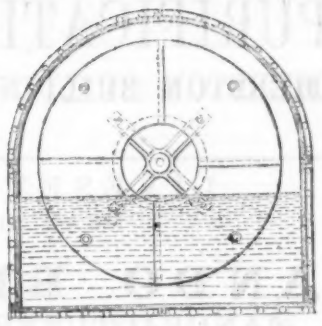
INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; **and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers.** That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. Kirkham and Hersey. *The Gaslight and Coke Company, Beckton, North Woolwich, June* 8, 1880.

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor and the second with water. Of course the fact of our having ordered two more, in addition to the four which we have in use, is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. Kirkham and Hersey. *South Metropolitan (late Phœnix) Gaslight Company, Engineer's Office, June* 19, 1880.

Dear Sirs,—The "Standard" Washer which you supplied for use at our Vauxhall station has afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy of the general acceptance with which it appears to be meeting.

I am, respectfully yours, (Signed) CORBET WOODALL.

Messrs. Kirkham, Hulett, and Chandler. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3¾	3	1⅜	1½	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4½
„ 9	11	9	7	5	3¾	2½	1½	1	½	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10¾	8½	6¾	5	3½	2½	1½	1	½	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7½	5¾	4½	3½	1¾	1¼	½	0	10 „	61,000	Nil.	73°	64°	27°	26½	25½	5
„ 12	11	8¾	6¾	—	—	—	1¼	¾	½	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10¾	8¼	6	4¾	3½	2	1½	¾	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. Kirkham, Hulett, and Chandler. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from Kirkham, Hulett, *and* Chandler's *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

Messrs. Kirkham and Hersey. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. Kirkham and Hersey. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, Limited, 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

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WOOD PURIFIER SIEVES,

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Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

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ENGINEERS AND CONTRACTORS
FOR
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FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
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HEATING AND LIGHTING
STOVES.

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SCRUBBERS FILLED WITH BOARDS,
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GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;
ALSO LICENSEES AND MANUFACTURERS OF
WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;
ROUND STATION-METERS,
ON CAST-IRON STANDS.

SQUARE STATION-METERS,
WITH PLANED JOINTS.
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CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

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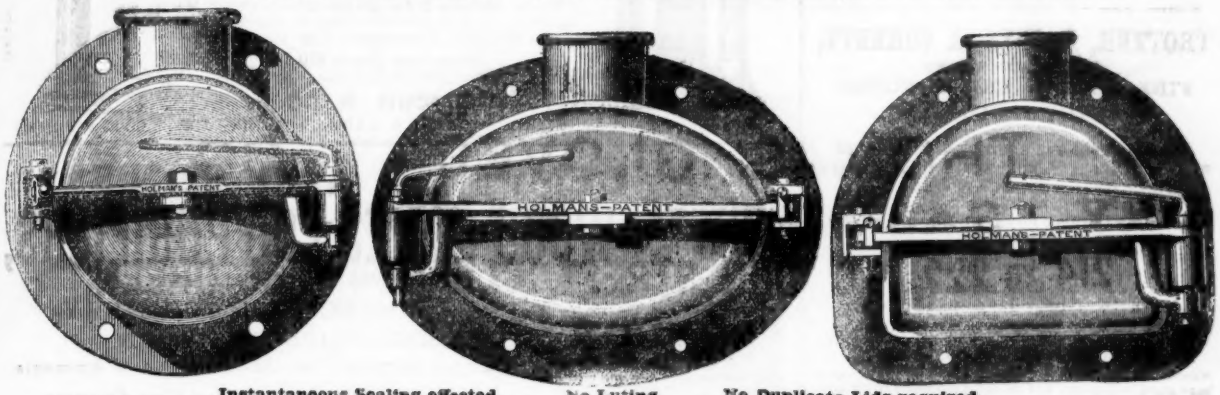
WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and Self-Sustaining Cross-Bars.



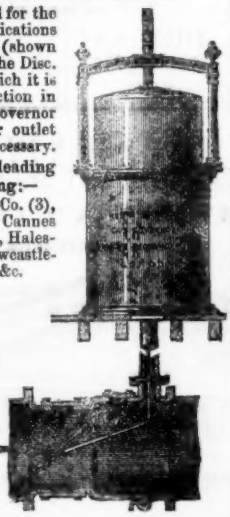
Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

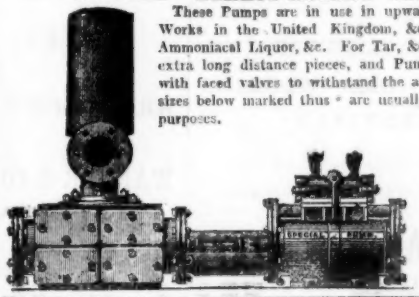
The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

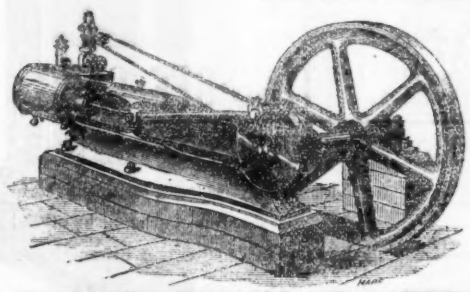
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.



These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.

The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2½ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



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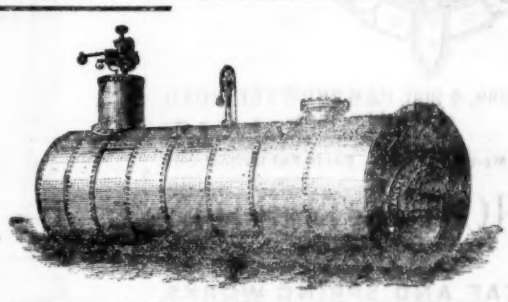
NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£66	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK

This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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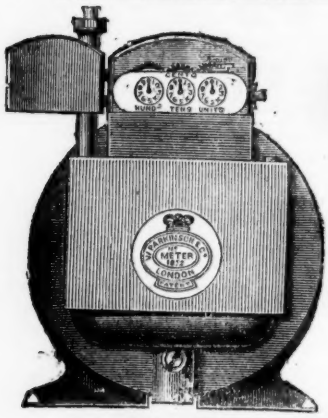
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.



(ESTABLISHED 1816)

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STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

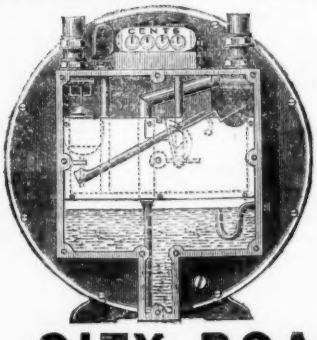
PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

SOLE AGENTS FOR

FOULGER'S PATENT SEAL UNIONS & CUTTING-OFF CAPS.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

CONTENTS.

Circular to Gas Companies:— PAGE
The Report and Accounts of the Chartered Gas Company . . . 209
The Report by Sir Joseph Bazalgette and Mr. Keates on the Recent Explosion near Tottenham Court Road . . . 209
The Possibility of the Amalgamation of the London Gas Company . . . 210
The Corporation Bill to Amend the Testing Clauses in the Metropolitan Gas Companies Acts of Parliament . . . 210
Birmingham Corporation Gas Supply . . . 210
Collapse of the Charges against Messrs Brickwell and Malcolm . . . 211
The Purchase of the Lincoln Gas-Works . . . 211
The Corporation of Norwich and the British Gas Company . . . 211
The Question of Cab Hire for the Salford Corporation Gas Engineer . . . 211
North British Association of Gas Managers—Mechanical Scrubbers . . . 212
Water and Sanitary Notes:—
The Report of the Select Committee on London Water Supply . . . 212
"Father Jean" and the Metropolitan Water Question . . . 213
Revival of the Scheme for Supplying the Metropolis with Water from Bala Lake 213
Completion of the Slough Drainage System . . . 213
Communicated Article:—
Explosive Mixtures of Coal Gas and Air. By Mr. W. Foster, M.A. &c. . . . 213
Correspondence:—
The Amalgamation of the South London Gas Companies . . . 214
Mr. Methven's Test for Illuminating Power . . . 215
Parliamentary Intelligence:—
Private Bills Relating to Gas, Water, &c. . . . 216
House of Commons Committee—Cork Gas Bill . . . 217
Report from the Select Committee on London Water Supply . . . 219
Legal Intelligence:—
High Court of Justice—Chancery Division—Davis *v.* The Isle of Thanet Gas Company . . . 220
Central Criminal Court—The Extraordinary Charges against Directors of a Gas Company . . . 220
Miscellaneous News:—
Suggested Purchase of the Isle of Thanet Gas Company's Works by the Margate Corporation . . . 213
The Gas Supply of Norwich . . . 215
North British Association of Gas Managers . . . 221
Birmingham Corporation Gas and Water Supply . . . 224
Meeting of the Taunton Gas Company . . . 225
The Price of Gas in Manchester and Leeds . . . 225
A Price Indicator for Gas-Meters . . . 225
The Purchase of the Lincoln Gas Works by the Corporation . . . 225
Final Meeting of the Nottingham Water-Works Company . . . 225
Trade Notes from Scotland . . . 226
Newcastle-under-Lyme Gas Company . . . 226
Trade Reports . . . 226
Chard Gas Company . . . 227
The Proposed Purchase of the Folkestone Water-Works . . . 227
The Costs of the Opposition to the Exeter Gas Bill . . . 227
Death of Mr. Blakelock Smith, of Sheffield . . . 227
Register of Patents:—
Applications for Letters Patent . . . 227
Patents which have passed the Great Seal . . . 227

TO CORRESPONDENTS.

W.L.C.—*Yes; under the 153rd section of the Public Health Act*, 1875.

E.H. *writes:* "*Can you or any of your Correspondents give any information as to Hurd's Gas Engine, whether it is efficient. I believe it is made at Wakefield?*"

We have received from Mr. Robert Rawlinson, C.B., a copy of the "Report of the Royal Commissioners appointed to Inquire into the Sewerage and Drainage of the City of Dublin and other matters connected therewith," recently presented to both Houses of Parliament, and shall take an early opportunity of referring to it in our columns.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 10, 1880.

Circular to Gas Companies.

THE report of the Directors of The Gaslight and Coke Company for the half year ending the 30th of June is now before the public, together with the statement of the accounts of the Company for that period, and is remarkable chiefly for its extreme brevity. Seldom has a document of this nature and importance—possessing the character of an official retrospect and forecast combined, to show the position and prospects of an undertaking of such magnitude—been presented in such laconic terms. If the maxim that a nation is to be considered happy whose history is a blank may be accepted as truth—and experience has shown it to be such—then the same may be said of a trading corporation whose managers are enabled to give a satisfactory account of their stewardship for six months in four or five concise paragraphs like those which are before us.

The report commences by mentioning in suitable terms the great loss which the Company have sustained by the death of Mr. F. J. Evans, whose name was so long identified with the interests of the great organization which he helped so materially to strengthen and develop. We have already expressed our sense of the obligations which the Company owe to their late Engineer and Director, especially in connection with the Beckton establishment, and on the present occasion we need do no more than record the satisfaction which will be generally felt as to the recognition of his services now, as formerly freely manifested by his official friends and his colleagues. In the nature of things this will probably be the last time that Mr. Evans's name will appear prominently in the half-yearly reports of the Company, but we may be assured that his memory will long continue fresh in the minds of those who knew him, whenever these semi-annual statements appear.

The Directors, as might have been expected, refer in guarded terms to the disastrous and altogether extraordinary explosion of the new trunk main in the neighbourhood of Tottenham Court Road, which lately brought their distributing arrangements into such unenviable notoriety. It is, of course, too soon to state the results of the disaster as affecting the Company; but the Directors are enabled to affirm that the consequences of the accident have proved to be less grave than they at first apprehended.

The Bill introduced by the Corporation of London, which would have seriously affected the Company, has been amended, the report states, through the interposition of the Board of Trade, with the concurrence of the Metropolitan Board of Works, and is consequently now less objectionable to the Company than as it originally stood; but beyond this negative qualification the Directors do not express any opinion respecting the measure.

The accounts to the 30th of June, the report concludes, show that the net profit, after providing for all preferential charges and maximum dividends on the "B" and "H" stocks, enable the Directors to recommend a dividend on the ordinary stock of the Company at the rate of eleven per cent. per annum; which the Proprietors will in all probability regard as highly satisfactory.

Turning now to the detailed statement of accounts, we find a few facts of general interest. Rather over £104,000 has been expended on capital account during the half year, which is considerably less than in the previous six months, when £179,364 2s. 5d. was so expended; so it will be seen that the Company are quietly but steadily getting through their authorized capital at the present rate, allowing for credits, of over a quarter of a million per annum. Coals, as appears by the revenue account, cost £455,364 8s. 6d., or about £400 more than during the previous half year, and about 7000 tons more common coal was carbonized. The receipts for coke, £113,817 2s. 2d., were over £6000 less than for the preceding period, a falling off in the quantity sold being visible; but 10,300 chaldrons less were used in manufacture. Nearly £28,000 more was realized from sales of tar than in the previous half year, while the revenue from tar products fell over £11,000. Ammoniacal liquor realized £3300 more, and sulphate of ammonia nearly £3700 more than during the half year ending Dec. 31, 1879. There was an increase of 164,586,000 feet in the quantity of common gas, and of 18,565,000 feet in the cannel gas sold, which means that the Company have to provide every year for an amount of extension of their manufacturing plant equal to an entire gas-works for a good-sized country town. Such is the nature of the statements given in these accounts; for a more general purview of the Company's operations we must await the Governor's speech at the ordinary meeting, which will be held on the 13th inst., when certain subjects very lightly touched on in this report will probably be considerably enlarged upon and discussed.

The joint report made to the Metropolitan Board of Works by their Engineer and Consulting Chemist, upon the recent explosion near Tottenham Court Road, and which we gave in last week's issue, is a full and interesting account of the circumstances of the case. The Board ordered that copies of it should be sent to each of the Metropolitan Gas Companies, and they have accordingly been sent. The only "moral" drawn by the reporters is, "Don't test mains in "which there may be a mixture of gas and air by applying "a light to them"—a lesson hardly necessary to be read to the officials of Gas Companies. We have already remarked that only a condition of momentary insanity can explain the unfortunate act of the man who was the immediate cause of the recent accident, so contrary was it to what ordinary prudence would have suggested. In this respect the occurrence was an accident in the broadest sense of the term, against which it would have been morally impossible to guard. The narrative, however, of all the circumstances has an interest which goes beyond the conclusions reported to the Metropolitan Board, and the little pamphlet before us will be valued as a historical record of them.

We note that Sir Joseph Bazalgette and Mr. Keates are of opinion that there were seven distinct and separate explosions in the main, due to the accumulation in as many places of the requisite mixture of gas and air; and that, in the remainder of the tube, gas was present in sufficiently large or small proportion to avoid danger of explosion, but adequate to the conveyance of flame. We are unable to agree

with the conclusion so arrived at. Our observation of the local circumstances at the various points where the explosion found vent satisfied us that they were each of them comparatively weak places, where either the vertical depth was less than the average, or the lateral resistance was lessened by a near approach of the pipe to the areas of houses. These causes were apparent, and it is hardly probable that they would exactly agree with the local accumulation of the explosive mixture. If we assume that there was such a local accumulation in the length which lay under Tottenham Court Road at a depth of some nine or ten feet, is it probable that the force of the explosion would find vent by casting up that enormous weight rather than traversing the main for a distance of some fifty yards to find escape in Percy Street, where the depth was only two feet, and the resistance from that cause consequently almost *nil?* Again, the conditions at the end farthest from where the gas probably entered were such as to allow of an explosion of great violence; they were the same, according to the theory of the report, at the place where the gas was entering—namely, at the valve in Howland Street, because there also a considerable eruption took place. So that at both ends of the half mile—where the gas was finding ingress, and where consequently it is not unnatural to suppose it would be present in the largest proportion, and at that farthest away—the explosive conditions were found. Is it then probable that intermediately there were long reaches where such conditions did not exist? We are rather of opinion that the proportions of the mixture were fairly uniform throughout the length; that the main was, in fact, like an enormously elongated cannon, the charge of which would take some time to burn through; and that the force of the explosion was not immediately spent at the first opening, because, the material existing all along the length, fresh fuel was found right on to the end. The evidence was not clear as to there having been appreciable intervals between the several explosions. That the first took place where the light was applied we know; but that was inevitable, and says nothing for or against either theory.

The near approach of the time for the ordinary half-yearly meetings of the Metropolitan Gas Companies gives pertinence to the criticism of the position of the London Company, which appears in another column, in a letter signed "Vigilans." We mean no disparagement of our correspondent when we say that he possesses largely the wisdom which comes "after "the event;" it is only another way of stating that he is capable of learning—while so many are not—the lessons of experience. Our views upon the general question of amalgamation, and upon its application to the London Company in particular, have been frequently stated in the "Circular," and we do not need to repeat them. We conceive that the questions of importance to the London Company now are the same as for some time past, except for their urgency—namely, first, Is amalgamation a good thing or not under their circumstances? and, assuming an affirmative answer to that, then, secondly, Is it probable that the conditions of such amalgamation will be more favourable to them later on than they are at present?

It appears to us that the London Company will favour prompt amalgamation or oppose it, just in the degree to which they have faith or not in a prosperous future for gas lighting. If we are blest with prosperous days, then, as "Vigilans" points out, so much the poorer are the chances of a good initial price when the inevitable application to Parliament has to be made; while if the dividends of the two Companies able to offer amalgamation continue to rise—and there seems no reason why they should not—so that the London Company are in that respect placed at a still further comparative disadvantage, they must be prepared to take terms based upon the privilege granted them. Thus prosperous days will prove unfavourable to the assumed policy of the London Board—that of maintaining their present independent existence, and we do not think that arguments based upon possible or probable times of great adversity will weigh heavily just now with Shareholders who are asked to forego a certain and considerable increase of dividend.

Gas Companies, we have frequently remarked in these columns, are looked upon, as a rule, by Corporations and Corporation officials, as "fair game" for almost any species of ill-treatment; but, for the perfection of sharp practice, commend us to the manner in which The Gaslight and Coke Company have been dealt with at the hands of the Corporation of London in the course of the passage through its final stages of the Bill introduced by the latter body for regulating the testing of gas and the recovery of forfeitures for defective supply by the Company and the South Metropolitan and Commercial Companies. Our readers will remember how the Bill was first of all promoted by the Corporation without the concurrence of the Metropolitan Board; who, however, subsequently consented to assist in getting it passed, on being exonerated from the payment of any costs in connection with it. The Board of Trade then arranged for a conference between the three Companies, the Corporation, and the Metropolitan Board; and, after much negotiation, the provisions of the Bill were mutually agreed upon. The three Companies at once withdrew the petitions they had presented against it, on an undertaking being given them that, subject to the consent of Parliament, the Bill should be carried forward in its agreed form. In this way it passed the House of Commons as an unopposed measure, and was sent to the Upper House. On its appearance there, however, it was found to contain one entirely new clause and some very important modifications, made by the Remembrancer of the City, of which no notice had been given to the only one of the Companies—the Chartered—whom they concerned. The effect of the alterations thus sprung upon the Company, if the Bill had passed in its then shape, would have been that the City Authorities would themselves have been the arbiters in any dispute that might have arisen under its provisions; the Aldermen of the Corporation being empowered to try any case of complaint, in reference to the gas supply, arising within their jurisdiction. The Company refused to accept any amendment at all—least of all such an one as that proposed—of the agreed Bill; and, as the Corporation would not listen to reason, petitioned to be heard before the Lords Committee. In this determination they were supported by the Board of Trade, who intimated that unless the obnoxious clause was struck out of the Bill, it could not pass. To this the Corporation had to assent, and thereupon the Company withdrew the petition they had presented. So the matter thus far ended.

But the annoyance to the Company did not here cease, for when the Parliamentary Committee of the Metropolitan Board, at the meeting last Friday week, reported upon the subject, a member—who, by-the-by, is also a member of the Corporation, and therefore should have known the facts, and might have known them had he made inquiry, as he ought to have done before speaking on the subject—is stated to have remarked that "he thought the ratepayers of the Metropolis "had reason to complain that they should be put to the "expense of another contest in this matter after the Bill had "been passed by the Commons, and after its provisions had "been settled by the Board of Trade, with the consent of "all parties concerned. Everything having been arranged "amicably and satisfactorily, the Chartered Gas Company "had determined, at the last moment, to put the ratepayers "to all this expense. The power of a Company to adopt a "course of this kind should, he thought, receive the attention "of Parliament." Not content with a statement so utterly misleading, there appeared the following day, in a weekly newspaper with which his name is associated, a paragraph on the leader page directing attention to what the writer of it chose to call "a step which no one would have anticipated "from the Directors of such a great and important public "undertaking;" and about which he required "some explanation." Was any one so likely to be in a position to afford the needed explanation as an officer of the Corporation, who could easily have been applied to if the *facts* of the case were required to be known? After briefly referring to the Bill, and to the "keen and clever legal adviser" of the Company—one had need to be keen and clever in dealing with such people as the Corporation have shown themselves in this matter—the paragraph concludes: "We hope, now that "the attention of the Board of Trade has been called to the "matter, that the Directors of the Company will see the "propriety of at once withdrawing the petition." The Directors of the Company have fulfilled the hope thus expressed, but simply because the need of the petition was done away with by the Corporation withdrawing the clause objected to. The whole proceeding only shows the unseemly way in which Gas Companies are frequently treated through ignorance and prejudice.

It is not every Gas Committee that has the pleasure of seeing its Chairman translated into a Cabinet Minister, and it would, therefore, be mere cavilling to find fault with the somewhat fulsome acknowledgments which, as appears by the last report, the Birmingham Gas Committee addressed to the Right. Hon. Joseph Chamberlain, M.P., on his resigning office in connection with the Corporation, in order to devote himself to the duties of his high position in Her Majesty's

Government. It is not necessary to quote in full the resolution passed by the Gas Committee on this occasion; it was, as we have said, excessively complimentary to the late Chairman, ascribing to him the success which has attended the operations of the department ever since its creation, and we can only hope that the illustrious recipient of these honours has left his mantle behind him, or we might be led to infer, from the terms of the resolution, that without him Birmingham will be desolate, and the Gas Committee like sheep without a shepherd.

The Committee, in the course of their report, allude to the pressing need that exists for better accommodation for the staff of the department, and for persons having business to transact with them, and it appears that efforts are being made to provide a new building for suitably housing the department and the new Art Gallery. They do not do these things by halves in Birmingham, and it may therefore be taken for granted that the Committee's new offices will equal anything of the kind to be found elsewhere.

The report states that the sale of gas for the half year ending the 30th of June was 1,388,741,200 cubic feet, or an increase of $3\frac{3}{4}$ per cent. over the corresponding period of the previous year, and from the favourable state of their affairs the Committee hope to be able to reduce the price of gas in January next. Little was said as to the progress of the movement for the separation of the outlying districts from the undertaking, by transferring them to their respective Local Authorities. The Oldbury and Tipton arbitrations are not yet completed, and the Smethwick proceedings are postponed until the former disputes are settled.

The charges against Messrs. Brickwell and Malcolm, the Chairman and Deputy-Chairman of the Tottenham and Edmonton Gas Company, were submitted to the Grand Jury of Middlesex on Tuesday last, and by them summarily—we might almost say contemptuously—dismissed. "No true "bill" was found on any of the counts of either of the indictments. Although it was difficult to believe in the possibility of any other issue, yet a sense of relief will be experienced by others besides the two gentlemen most interested, now that the case is finally disposed of. So far as it was within the power of the Court to wipe away the stain from two honourable names, it was done. Both the charge of the Recorder and the action of the Grand Jury go to show that the prosecution was one which should never have been commenced, and the defendants came out of the fire without having suffered in the ordeal. That the fairest character may be smirched by the casting at it of unlimited "mud," is an article of faith with most men; but we believe in this case the stains will be upon those who were the aggressors. From the commencement of the proceedings it has appeared to us to have been the two prosecutors who have been upon their trial, rather than the nominal defendants; and the discredit resulting from it—and there is much discredit—rests with them, and not with Messrs. Brickwell and Malcolm. The bringing of so grave a charge as that made could only have been justified by a strong compelling sense of public duty. When fairly open to the suspicion of interested personal motives, as in this case, it is difficult to speak too strongly in its condemnation. If anything was needed to show how baseless the whole of the charges and insinuations were, it was afforded by a special meeting of the Shareholders of the Company held last Saturday week. At this meeting, which was unusually largely attended, a resolution of confidence in the Directors was carried unanimously, and it was only in deference to the opinion of the Company's Solicitor, which was adverse to the expressing of an opinion upon a case which was then *sub judice*, that the Shareholders refrained from emphatically condemning the conduct of the prosecutors. Clearly the bulk of the proprietary is able to appreciate and remember the claims of past good service, and, as they have practically made an election between the old and the alternative offered, we cannot but congratulate them on their choice.

The agreement for the purchase by the Corporation of Lincoln of the undertaking of the Lincoln Gaslight and Coke Company was sealed at a meeting of the Town Council on Tuesday last, and the Corporation will take the management of the works on the 1st of July next year. The negotiations for the transfer have been very quietly and amicably carried out, and the city will become possessed of a thoroughly good property on very easy terms. Some opposition of a feeble character was offered to the sealing of the agreement, but it was too late, and of too little weight, to stay the proceedings. In the course of discussion the well-known plea of relief to be afforded to the rates out of the gas profits was brought forward; but the gas consumers also found an advocate. It is, of course, too early as yet to tell how the administration of the undertaking will be eventually characterized, or whether the future Gas Committee will be guided by the example of Leeds, or Manchester, or of any of the hybrid specimens which may be found between those two extremes. Time will show; but meanwhile the gas consumers and their friends should not neglect any opportunity of educating the Council, if necessary, in the principles of sound finance during the year of preparation which still lies before them.

The Corporation of Norwich are disposed to do something very dreadful, but they do not precisely know what, in opposition to the British Gaslight Company, who at present light the town. Stirring speeches were made at the last meeting of the Town Council, with intent to prove that the gas consumers of Norwich have been robbed of enormous sums in the shape of excessive charges during the past, which the Council were called upon to prevent in the future; and, in the end, a resolution was passed referring to a Committee the whole question of the relations of the Gas Company with the town, with special instructions to them to report as to the best means of delivering the inhabitants from the monopoly possessed by the Company. An order for an inquiry into the possibility of the adoption of electric lighting for public purposes in the town was also tacked to the resolution. It is curious to observe how, in all cases of disagreement between a Local Authority and a Gas Company, the revenue which the latter derive from the gas consumers is always mentioned by the former as something contributed by the town, the interests of gas consumers and those of the locality being always fused together. But when the same Local Authority, by successfully trading on the sufferings of the gas consumers, become possessed of the gas undertaking, the consumers may be made to "bleed" quite as freely as before for the benefit of the ratepayers and the town, and the community thus becomes divided in a manner undreamt of when the Gas Company was the general oppressor of all. But this by the way. Some members of the Norwich Town Council are dissatisfied with the accounts of the British Gas Company respecting the working of their station in the town, and one gentleman has favoured his colleagues with a long statement of what the working results ought to have been. As he was not in agreement with the Company's accounts, he was pleased to charge little less than fraud on the Directors, in language which the mental intoxication induced by the frantic applause of some of his friends could alone have led him to use. We need not follow his arguments in detail, since it is plain that any one who selects his data from anywhere he pleases can bring his conclusions to any point he may desire. His arguments were ingenious, and he had collected his facts from all parts of the kingdom, bringing Belfast and Plymouth into close proximity for once; but, as the particular Company upon whose affairs he wished to throw light, have agreed to furnish detailed accounts when required, it would appear that they must be judged by their own statements, and the truth of those statements must be directly challenged in the only proper way. However, the Norwich Town Council may now rest awhile until their Committee have reported, and in all probability the warning uttered by one speaker, to the effect that nothing short of an application to Parliament for power to establish gas-works of their own would serve their purpose, will sink very deeply into their minds, and damp their enthusiasm by the certainty of a heavy bill of costs arising from such a radical procedure, without corresponding certainty of success.

The momentous question of the travelling expenses of the Gas Engineer of the Salford Corporation, recently referred to in these columns, is settled for the time on the old basis, the Gas Committee having succeeded in maintaining their position, although not without a tremendous conflict, in the course of which they were compelled to announce that in the event of defeat they would place their resignation in the hands of the Council. The whole affair reads very much like an account of a storm in a teacup; but, as an example of what some local representative bodies are prone to fall into, it is not altogether uninstructive. Salford is, of course, a rather exceptional place, being little more than a manufacturing suburb, and in consequence showing in its Corporation much of the same character that has from time to time made some of the Metropolitan Vestries so famous—a character which is perhaps better described by the word "porochial," than by any other. Considerable allowance must be made for a small individual suddenly thrust into a position in which he has

the power of influencing the fortunes of a business undertaking in which he has no direct pecuniary interest. Such men, of whom there appear to be several in the Salford Town Council, are frequently led into strange excesses by their zeal for reforming an administration whose very rudiments they do not understand, but it is consoling to observe that in the extraordinary case in point they failed to carry a proposal which would have inflicted lasting discredit on themselves and their colleagues.

The subject of scrubbers, particularly in relation to small gas-works, was pretty well ventilated at the recent meeting of the North British Association of Gas Managers at Perth, the first portion of the report of the proceedings at which we give elsewhere to-day, when the leading varieties of these useful appliances were all recommended by different speakers. Strenuous efforts were made to show that every sort of scrubber was a Scotch invention, or, if not, that it ought to have been; from which we may infer that scrubbers are growing in favour among our brethren beyond the Tweed. We are not disposed to enter into a controversy on this great question, feeling assured that from whatever source they originated their economy and other advantages are enough to recommend them to any part of the kingdom where clean and bright gas is desired, and nowhere is this in greater request than in North Britain.

Water and Sanitary Notes.

THE report of the Select Committee on London Water Supply made its appearance on Friday, and its full text will be found in another column. It is a document of very moderate length, and its purport may be described as embodying two proposals —first, that Sir Richard Cross's provisional agreements with the Water Companies should be set aside; and, secondly, that the responsibility of determining questions affecting the source, the nature, and the price of the Water Supply of the Metropolis should be remitted to a representative body, to be created by Parliament, and designated a "Water Authority." "Without absolutely prescribing" the composition of such a body, the Committee express their opinion that "it should include "elements to be derived from the Corporation of London and "the Metropolitan Board of Works, together with a due repre-"sentation of the districts at present supplied by the Metro-"politan Water Companies, which lie beyond the jurisdiction "of the Corporation and the Metropolitan Board." This part of the report bears some resemblance to the clauses which were to have created a Water Trust under the Bill of Sir Richard Cross. But we miss the Imperial element, as represented by nominees of the Crown, and the holding of office "during the pleasure of Her Majesty." So far we acknowledge improvement.

To the Authority thus created, should Parliament adopt the proposal of the Committee, it is recommended that "the "largest discretion" should be entrusted "as to the best-"method of dealing with the Water Supply of the Metroe "polis." Of course one method would be to buy up the existing water-works, thereby fulfilling the proposition which stands at the very head of the report—"That it is expedient "that the Supply of Water to the Metropolis should be placed "under the control of some Public Body, which shall repre-"sent the interests and command the confidence of the water "consumers." But, very curiously, the Committee seem to contemplate the possibility of leaving the Water Companies out of the scheme altogether, the purchase of the existing water-works being treated as a sort of contingency which may or may not come to pass. Thus it is coolly remarked—"That for certain purposes, at least, it would be desirable to "acquire the undertakings of the existing Companies, if the "same could be obtained upon fair and reasonable terms." We cannot but think that the Committee, in agreeing to such a recommendation as this, must have been possessed by a very inadequate idea of what the existing water-works really are, and what is involved in the execution of such works. On this part of the subject, the Committee left themselves miserably in the dark. They had Lieut.-Col. Bolton before them, prepared with a mass of information of the most precise and comprehensive character, as to the nature and value of the London Water-Works; and nearly all that this witness was called upon to do was to enter into a sort of chit-chat with the Committee and the learned Counsel. The most substantial part of Lieut.-Col. Bolton's evidence was a document in the form of a letter, showing somewhat in detail what would be the advantages of transferring the present works to a Public Authority. But all this seems to be passed by in the report, and there is a strange disregard of the magnificent opportunity which awaits a Public Authority having the entire command of the Companies works. *The Times*, commenting on the paragraph to which we have just referred, says: "There can be little doubt that the existing "undertakings would have to be purchased for the purpose "of any such arrangement as is recommended." It is further observed by *The Times* on this point: "What is practically "proposed is that the ratepayers should have a monopoly of "their own water supply, and with this object it would be "imperative to buy up the interests of those in whom a "similar monopoly now exists."

The Select Committee must have been influenced by a very faint appreciation of the magnitude of the question they were dealing with, in fancying that a daily water supply of 140 millions of gallons was capable of being set aside as something obsolete and undesirable. Whether the colossal enterprise which at present furnishes one of the prime necessaries of life to more than four millions of people is to be recognized or not, appears to be a very subsidiary matter in the estimation of this sublime Select Committee. With a wave of the parliamentary wand, a new supply, it is thought, may be introduced, to compete with that which now exists; and all the engineering skill which has given London an array of water-works costing £12,000,000 sterling is to go for nought. If there was extravagance in the contemplated terms of purchase, there is yet greater extravagance in the scheme propounded by the Committee. It is true that they refer to the purchase of the existing undertakings as one of the possible solutions of the question; but it assumes a by no means prominent position in their report. The introduction of an independent supply is distinctly countenanced, and it is suggested that this could be obtained on easier terms than buying up the old works.

In sketching the future of the Metropolitan Water Supply, the Select Committee observe that "various courses might "be adopted" on the part of the Water Authority. There might be a new Regulation Bill, or an independent water supply, or a purchase of the present undertakings. "It "would be the duty of the Water Authority," says the report, "maturely to examine which of the three schemes, separately "or in combination, would be most advantageous to the "public." The Water Authority having made its choice, "the judgment of Parliament" would then have to be exercised, and possibly what the Authority proposed, Parliament would disapprove. Certainly the Water Authority cannot be created until next year, and it can have no scheme ready until the year after. In the meantime, the Companies will make progress in the way of business, and the value of their undertakings will increase. *The Times* expresses dissatisfaction with the manner in which the Committee have disposed of the provisional agreements. Thus we read: "On "the whole, it is to be wished that the Committee could have "offered more conclusive grounds for their advice that the "agreements should be allowed to lapse." The argument concludes as follows:—"We should, no doubt, have paid "heavily under the agreements which are now void, but it "is difficult to look forward with much confidence to our "obtaining much more favourable terms in the future." We are inclined to think, viewing the subject purely as it affects the public interests, that the future is rendered all the darker by the report of the Select Committee.

"Father Jean," in the columns of the *Echo*, is discussing the Water Question in language not always easy to be understood. We have our doubts whether on one point he himself quite comprehends the meaning of the report of the Select Committee. This, however, is a small matter, in the presence of such eloquence as the following:—"No arbitration must "be suggested. We demand attention to two lines only—"purchase, if reasonable terms are asked; if not, a scheme for "a competing supply, which will leave the millions of London "to work out their own destinies. We have no fear of the "result." There appears to be more in this Water Question than we imagined, and "Father Jean" is clearly a much greater man than we thought him to be. He has the quality of soaring above all ordinary mortals. In discussing the legal conduct of the case before the Select Committee, he goes far beyond the old advice which tells the defendant's Counsel to abuse the plaintiff's Attorney. He quarrels with all alike. "Looking back," he says, "at the addresses of both Counsel "for the City and the Board, we have no hesitation in saying "that they lamentably failed to grasp the points the people "desired to put forth, and, perhaps, if the Companies spoke "their mind, they would express the same sentiments of "their own Counsel." The zeal with which "Father Jean" puts the Metropolitan Board forward in preference to the

Corporation, is a singular feature in his letters. On the whole, we have not met with any writer of whom this eccentric scribe more forcibly reminds us than the oracular "Man-"hattan," who figured some years ago in the columns of the *Standard*. Unfortunately "Manhattan" no longer exists, or we might fancy we had a clue to the identity of "Father "Jean."

A proposal for supplying the Metropolis with water from Bala Lake, in North Wales, makes its appearance in print, and is said to have been submitted to Sir W. Harcourt for consideration by the Select Committee on London Water Supply. The author of the scheme is Mr. J. W. Welborne, and his proposal is to convey the supply from Bala through a series of iron pipes, sunk to a depth sufficient to protect them from the action of the frost, along the "sidings" of the Great Western Railway to Stanmore, where enormous reservoirs are to be constructed. Thence the water is to be conveyed into the mains of the London Water Companies, the level at Stanmore being such as to give high pressure. We have not seen the estimate, neither are we told what the authorities of the Great Western Railway think of the project. The Select Committee say they "have not had before them any specific "scheme for an independent supply of water, and general "speculations on the subject are of little value without "detailed plans of the sources from which it is to be derived, "and the cost of carrying it into effect."

The Slough Authorities have just completed an extensive system of sewers designed to receive the drainage of the houses, but excluding the rainfall, the latter being provided for by means of the old sewers. The new sewers are also carefully constructed so as to prevent the infiltration of subsoil water. The contents of the new sewers will be applied to irrigation purposes. The house connections are not yet made. It will be interesting to learn by-and-by what is the difference between the discharge of the new sewers and the old, in respect to the degree of pollution.

THE sum of £50 has been given by an unknown donor as the nucleus of a prize fund for an essay on the best way of carrying out the sewerage of Sydney, New South Wales.

THE *Journal des Usines à Gaz* announces that M. Pelouze, one of the Directors of the Paris Gas Company, and co-inventor with M. Audouin of the condenser bearing their names, has been nominated an officer of the Legion of Honour.

THE Wolverhampton magistrates last Tuesday fined a member of the Town Council £5, and costs, for turning spent acids from his works into the town sewers, to the detriment of vegetation at the Corporation's sewage farm. The Town Clerk said that the best mode of freeing the acid of its injurious qualities was to fill a hole with limestone, and let the acid percolate through it into the sewer.

THE accounts of the Metropolis Gas Companies for the year 1879, presented to Parliament, in pursuance of the Metropolis Gas Act, 1860, The Gaslight and Coke Company's Act, 1876, the South Metropolitan Gaslight and Coke Company's Act, 1876, and the Commercial Gas Act, 1875, were issued on the 27th ult. We have had our usual abstract of the accounts prepared, and hope to be able to place it before our readers in the next issue of the JOURNAL.

THE *Citizen* in a recent issue said: "At a large commercial house in the City, some of the assistants have—very commendably—formed themselves into a fire brigade, for the protection of the premises. For the purposes of practice an alarm of fire was raised the other day, and recourse was had to the nearest of the hydrants recently erected by the Corporation for the special object of extinguishing conflagrations. The hydrant was found to be out of order, and therefore of no use." Concerning this we may remark that the hydrants were not erected to afford amusement, nor yet employment, for the class of men designated by our contemporary "assistants" in a City "commercial house;" neither are the London Water Companies bound to supply water to every set of persons who choose to form themselves into an amateur fire brigade, or else any abstraction of water from their mains might be justified on the ground that it was intended for use in practising fire extinction. We would suggest that the ignorance of the "assistants" as to the working of the hydrant prevented their obtaining a supply of water from the one they had recourse to; and that as they were meddling with what did not (under the circumstances) concern them, it was as well the apparatus was of "no use"—to them.

SUGGESTED PURCHASE OF THE ISLE OF THANET GAS COMPANY'S WORKS BY THE MARGATE CORPORATION.—At the meeting of the Margate Town Council last Tuesday, Mr. Bloxham moved, and Mr. Coleman seconded, the following proposal:—"That it be an instruction to the Improvement and General Purposes Committee to consider and report to the Council, at as early a date as possible, the condition and cost of the gas supply of the town, and as it is supplied to the Corporation; to consider the cost of constructing works for the manufacture of gas for the purpose of public lighting; and, if thought desirable, to open negotiations with the Margate Gas Company for the transfer of their works to the Corporation; and to consider and report upon any proposals the Company may make, having regard to such transfer." The Mayor thought the Corporation might confine themselves, for the present, to the making of inquiries. Then, if necessary, they might consider the question of purchasing the present concern. Alderman Chambers said he could agree to go as far as that; but he would oppose going beyond the first two clauses of the motion. He strongly opposed the practice of borrowing money for the purchase of such undertakings or permanent works. He also complained of the purchase of the water-works by the Council. Mr. Bloxham said he was pleased to state that the water-works were being managed economically; they would pay their way this year, and there was every probability of a profit being yielded from them for the town. Mr. Walton thought the public were being misled with regard to the water-works, and he believed in two years time they would entail a cost of £20,000 on the town. After some further remarks had been made, the motion was put and carried, Alderman Chambers being the only dissentient.

Communicated Article.

EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By Mr. W. FOSTER, M.A., &c.,
Professor of Chemistry at the Middlesex Hospital.

THIRD AND LAST ARTICLE.

The property which gases possess of mixing together in opposition to the laws of gravitation was probably first observed by Dalton. He made experiments of the following character:—Two bottles were filled, the one with a heavy gas like carbonic acid gas, and the other with a light gas such as hydrogen. The latter was then inverted, and put in communication with the former by means of a piece of glass tubing several inches in length and about 1-20th of an inch in diameter, the tube fitting the neck of each bottle accurately, and being arranged in a vertical position. At the end of two or three days each bottle was found to contain a mixture of the two gases in the same proportions. Berthollet made similar observations with like results, but he took the precaution of keeping the two gases at a constant temperature during the whole of the time occupied in the experiments. It is to the late Dr. Graham, however, that we are indebted for a knowledge of the laws which regulate the admixture of gases under such conditions. He further observed that the tendency of two gases to mix together is not interfered with if the containing vessels are separated by thin plates of certain substances, such as compressed graphite, plaster of Paris, unglazed earthenware, and the like, provided these substances are in a dry state. It is also interesting to notice that Priestley, the eminent chemist, observed a similar phenomenon. In his experiments "on different kinds of air," he found that when different gases were transmitted through stoneware pipes surrounded by burning fuel, there was a loss of gas, whilst at the same time some of the combustion products of the fuel found their way through the substance of the pipe. This result was the more surprising because the gas passing through the stoneware pipes was maintained at a pressure considerably greater than that of the atmosphere.

It is obvious, from a consideration of the circumstances attendant on Dalton's experiments, that the knowledge they afforded was the character of the ultimate result; they gave no information respecting the superior rate at which the hydrogen mixed with the carbonic acid gas. It also follows, from the nature of the apparatus, that if the hydrogen does pass through the long narrow tube more readily than the carbonic acid gas passes in the opposite direction, this must give rise to currents along the tube from the lower vessel in consequence of superior pressure. In order to avoid this disturbing influence, and to ascertain the rate at which a light gas, such as hydrogen, diffuses into a heavier, such as carbonic acid gas, Graham arranged his experiments in such a way that there was no hindrance to free expansion or contraction on the part of the gases produced by the process of diffusion. As a simple instance, let us consider the case of oxygen and hydrogen. If two jars of equal capacity be filled, the one with hydrogen and the other with oxygen, they can be placed over water, and the pressure inside each jar can be easily kept at the atmospheric pressure by raising or lowering it in the vessel of water. The vessels can be made to communicate by means of a horizontal pipe bent twice at right angles. If a thin plate of dry plaster of Paris has been placed in the pipe previous to its being bent, the process of diffusion is not interfered with, whilst currents of the mixed gases along the pipe, arising from slight inequalities of pressure in the two jars, are avoided. It was found that during the interval necessary for the passage of four volumes of hydrogen into the jar containing the oxygen, one volume of the latter gas had passed into the vessel containing the hydrogen. In the case of two gases such as hydrogen and carbonic oxide, the rate of admixture was found to be different from that obtained in the case of hydrogen and oxygen; and by experimenting on several pairs of simple gases, it was found that the rate of admixture was connected in a simple way with the densities or specific gravities of the gases operated on. The law deduced by Graham from his numerous and varied experiments is expressed as follows:—The rate at which two gases diffuse or mix together when freely communicating by an open pipe, or when separated by dry porous material, is inversely proportional to the square roots of their respective densities. For instance, in the experiments with oxygen and hydrogen, the densities of which are 16 and 1 respectively, the rate of diffusion of the oxygen is to the rate of diffusion of the hydrogen as the square root of the density of hydrogen is to the square root of the density of oxygen; that is, as $\sqrt{1} : \sqrt{16} = 1 : 4$. It follows, therefore, that we are able, from a knowledge of the laws of diffusion of gases, to determine the rate of admixture of two simple gases under given circumstances, if the specific gravities are known, and the pressures which they exert are not allowed to interfere with the simple process of diffusion.

The theory of the action whereby gases diffuse into each other, though separated by porous materials, is known as the molecular theory of gases. It assumes that gases are made up of small masses called molecules, without attributing to them a definite size. These molecules (molecules are an assemblage of atoms) are continually in motion, and this motion may assume different characters. The molecule may have motion as a whole; and in addition to this there may be motion, within certain limits, of its constituent atoms. In order to realize the facts of the diffusion of gases, we need only consider the motion of the molecule as a whole. The molecules of every gas, even when such gas is said to be at rest, are ever changing their positions with reference to each other and the sides of the containing vessel. The space occupied by any given molecule is infinitely small, and the distance through which it can move before its motion is arrested is also infinitely small. The molecules move in straight

lines until they strike against one another or the sides of the containing vessel, when they rebound with a velocity equal to that possessed before the collision. They still move rectilinearly in different directions. The molecules are thus supposed to possess the attributes of a perfectly elastic body. The number of collisions which a molecule sustains during a second of time is infinitely great. Equal volumes of different gases at the same temperature and pressure contain the same number of molecules; that is to say, the size of the molecules of different gases under these conditions is equal. The pressure exerted by a gas on the sides of its containing vessel is due to the collisions of the molecules against the sides. In the case of two gases of different densities, say oxygen and hydrogen, placed in different vessels at the same temperature and pressure, but separated by a thin plate of porous material, there is an equality of pressure on each side of the porous plate, maintained by an incessant bombardment on the part of the oxygen and hydrogen molecules. As there is the same number of each in each unit volume, and as they are of widely different densities, it is necessary for the maintenance of equal pressure on each side of the plate that the lighter hydrogen molecules should move with a greater velocity than the heavier oxygen molecules; they must deliver a greater number of blows per unit of time. The striking force of a body varies as its mass, and it also varies as the square of its velocity; hence it is proportional to the product of these two quantities. Now, although we do not know the absolute weights of the molecules of gases, we know their relative weights. These are proportional to their specific gravities. Calling the weight of the hydrogen molecule unity, the weight of the oxygen molecule is 16. Denoting the velocity of the oxygen molecule by x, and the velocity of the hydrogen molecule by x', we have $x'^2 = 16\,x^2$ as the striking force on a given infinitely small area of the surface of the plate. Taking the square root of each quantity in this equation, we have—

$$x' = 4x; \text{ or } x' : x :: 4 : 1$$

that is, the velocity of the hydrogen molecule is four times greater than that of the oxygen molecule. These numbers, representing the relative velocities of the molecules of the two gases under like conditions as to temperature and pressure, are inversely proportional to the square roots of their densities.

As the hydrogen molecules have a much greater velocity than the oxygen molecules, it follows that they make a proportionately greater number of contacts with tLe sides of the porous plate than the oxygen molecules do on the other side; and, consequently, a larger number are capable of passing the pores of the solid in any given time. The case is somewhat similar to what would happen if two individuals on opposite sides of a wire screen were to fire equal charges of fowling shot with an equal degree of accuracy, the one firing four charges during the same interval that the other fired one. The number of "shot corns" passing in one direction through the screen would be four times greater than that passing in the other.

It is necessary, for the process of diffusion to take place through porous material, that the substance be perfectly dry. If the material be moist, its interstices become choked with liquid, and the motions of the gaseous molecules are completely arrested. Hence it follows that a substance may vary very much in its behaviour towards gases in this respect, the variation being dependent on its condition of dryness.

It is not necessary, for the diffusion of two gases to take place, that they should be separated by porous material. A crack or fissure in the sides of the vessel separating them is sufficient to allow admixture of the two to proceed. For instance, a cracked jar containing hydrogen cannot be kept over water without a diminution of the total volume of the gas in its interior; and a similar result follows if the jar be sound, but closed by a well-ground accurately fitting stopper—supposing the stopper to be dry, and not greased. In each of these cases the surfaces of the glass are in contact only at points, so that the hydrogen molecules (and also those of atmospheric air) are able to make their excursions between the sides of the solid glass surfaces and escape.

We have seen that coal gas is a mixture of several gases. Hydrogen, marsh gas, and carbonic oxide make up the bulk of any given volume. The densities of these three gases are 1, 8, and 14 respectively. Taking atmospheric air as having a density of 15, it is obvious, from a consideration of the laws of diffusion, that each of these three gases has a superior diffusive power to that of air. The diffusive power of carbonic oxide is nearly equal to that of air. Its amount in coal gas at the present time is relatively small, as will be seen from the analysis given in my first article. Hydrogen comes first in diffusive power; and as it is by far the most abundant constituent of coal gas, it follows that in all cases where coal gas diffuses into atmospheric air the great bulk of the gas so diffused consists of hydrogen. This is a point of some importance, because the mixture formed by air and hydrogen has more explosive force, and its rapidity of inflammation is much greater than a mixture formed by the original coal gas and air. Further, its injurious effects when inhaled are not so great as those of a mixture of the original coal gas and air. The carbonic oxide does not diffuse much more readily than atmospheric air, and as its proportion relatively to those of hydrogen and marsh gas in the original coal gas is small, its proportion in the diffused coal gas is very considerably diminished. In our domestic arrangements the taps used for turning on the gas supply, unless greased, are always a medium through which the coal gas can diffuse. It is, therefore, important to know that the more inoffensive hydrogen is the gas which particularly escapes, whilst the dangerous carbonic oxide is, for all practical purposes, retained in the original pipes.

In connection with this subject I have to notice some processes whereby gases mix together in a manner different from that which obtains in the experiments already given. If a jar be filled with hydrogen, and its mouth capped with a piece of moist bladder tied tightly round the neck of the jar, there is no opportunity for the hydrogen to escape, or for the air to enter, in consequence of direct molecular movements of either gas. The pores of the membrane are thoroughly closed by the presence of water. If such a jar, however, be introduced into a larger jar filled with carbonic acid gas, and the membrane kept moist, the latter soon commences to bulge outwards, showing an increase in the pressure, and therefore an increase in the gaseous contents of the smaller jar. In other words, the carbonic acid gas passes more rapidly through the moist membrane than the hydrogen passes outwards—a result of a reverse character to that obtained by the ordinary process of diffusion. The action in the present instance is due simply to the superior solubility of carbonic acid gas in water. If the bladder be allowed to become dry, the action ceases. If a jar filled with hydrogen be capped with an accurately fitting sheet of caoutchouc, and exposed to air, there is soon a marked depression of the surface of the caoutchouc, showing that the hydrogen is escaping more rapidly than atmospheric air is passing inwards. The explanation of these phenomena is that the gas passing through the membrane is reduced to the liquid state, and that there is a gradual transmission of such liquid particles from within outwards. The liquid particles re-assume the gaseous state on reaching the remote outer surface. Caoutchouc absorbs the gases present in coal gas, and more particularly the vapours of heavy hydrocarbons. Hence the smell arising from india-rubber tubing, when used for conveying coal gas, is due in a great measure to a continual evaporation of the constituents of the coal gas from the outer surface of the india-rubber tube. The process is therefore a continuous one, and not due to leakage in the ordinary sense.

Iron and other metals when at high temperatures behave towards certain gases much in the same way as caoutchouc. They have the property of absorbing them, and allowing them to escape from their remote surfaces. The gases absorbed are supposed to assume the fluid condition, and in this state are able to permeate the metallic partition at the high temperature. For instance, iron, at a high temperature, allows the passage of carbonic oxide through its substance; and it is by virtue of this property that steel is produced by the old process of cementation. But, though iron is permeable by carbonic oxide and other gases at high temperatures, we have no evidence that this is the case at ordinary temperatures. If there is a passage of a gas at the ordinary pressure through a plate of iron at the ordinary temperature, the cause is more likely to be due to the fibrous character of the iron and the thinness of the plate permitting the process of diffusion in the same way as a thin plate of a porous material.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE AMALGAMATION OF THE SOUTH LONDON GAS COMPANIES.

Sir,—The position of the London Gas Company has become peculiarly interesting. On all sides inimical influences are apparent, and it is now clearly evident, not only that amalgamation must ultimately be brought about, but also that the delay which has taken place in considering this question has been and is being prejudicial to its interests.

The time devoted to meetings of Shareholders is not, as a rule, sufficient to express, or digest fully, the ideas which indirectly, as well as directly, bear upon the question; and I have consequently resolved to trespass upon your space, hoping that, when the next meeting of the Shareholders of the London Gas Company is held, full consideration on the part of all then present will have been given to the important issues at stake.

The arguments made use of by the Board—when, at the ordinary half-yearly meetings, this matter has recently been brought forward—have been those of confidence and expediency. They, in effect, say, "We know your business better than it can be known by any one outside. We are large Shareholders, so your interests are ours; and you may with perfect confidence leave yourselves in our hands. We do not foresee any proximate necessity of applying to Parliament for increased capital, as our works are in excellent condition, and there is space for increase for some time to come. We manufacture as cheaply, and sell cheaper than the Chartered Company. In short, there is no necessity to hurry; we can afford to wait; and meanwhile, if any Company wants to buy us, let them make an offer, and we will duly consider it."

I do not think I here misrepresent, in the slightest degree, the position which the Governor and Directors of the London Company take up, and endeavour to hold on this question. It is a policy of masterly inactivity, and probably they may have felt that under the circumstances it was the best. Has it been so, however, or does it appear likely to be so towards the end which is now pretty evidently approaching? These are the interesting questions it behoves the Shareholders to study. Besides there is a somewhat grave suspicion as to the willingness of the Board to receive and consider an offer. I do not wish in the slightest degree to express a doubt as to the action of the Board being dictated by their sense of the interests of the Company; but Mr. Livesey made a statement at the last meeting, explanatory of what had been done by the South Metropolitan Company with a view to bring about an amalgamation, and of the manner in which it was received by the London Company; and there can be little doubt, from the explanation given, that the approaches of the sister Company had been received in a somewhat shy, if not a positively cold manner. It seems evident that an opportunity was lost, which, when it returns, may not find the London Company in the comparatively advantageous position it then occupied.

In questioning the prudence of the somewhat tardy action of the Board, I disclaim any want of confidence in the general management of the Company. I believe that, in the economical disposal of the business, the utmost care is taken and attention bestowed; but I am unwillingly forced to the conclusion that the higher-class qualities of management are to some extent deficient. Mistakes have been made, rather of omission than commission; and although these cannot now be corrected, or the position retrieved, still present action may prevent matters from becoming worse, and the best possible made of what can now scarcely avoid being an unfavourable bargain. According as it is managed, the ultimate, as well as proximate value of stock will be affected, and I think the issues are sufficiently important to warrant me in fairly considering some of the omissions I have referred to, and what their consequences have been.

The South Metropolitan Company, from their proportionately low capital as compared with revenue, have in recent times occupied a point of vantage amongst Metropolitan Gas Companies; and, while paying maximum dividends, they have been able to sell gas much cheaper than the others. This very point was, however, I believe, used against them in fixing the standard price under the sliding scale—as the Commercial Company in 1875, and the Chartered in the year following, were both able to obtain an initial price of 3s. 9d. per 1000 feet, whereas the South Metropolitan Company, which somewhat tardily, in 1876, adopted the views advocated by Mr. Livesey, were only enabled in that year to get a standard of 3s. 6d. Probably subsequent to this latter figure being accepted by he South Metropolitan, it might have been difficult or impossible for th London Company to have succeeded in securing any higher figure; b . if, in 1875, or previous to the date of that arrangement, they had gone in for it, in all probability the London would have had identical terms with those accorded to the Commercial and the Chartered, because their conditions of capital and revenue much more nearly resembled these Companies than they did the South Metropolitan. Had they therefore (as in all probability they could have) obtained this initial price, a subsequent coalition with the Phœnix would either, as in the case of the Commercial Company, have enabled them to stand alone, or the South Metropolitan Company might have been absorbed upon something like equal terms—that is, the low initial price, combined with its comparatively small business, would possibly have formed a counterpoise to the high dividend-paying power of that Company.

It is fair, however, to look at the matter also from the point of view apparently taken by the Board of the London Company when the critical moment of decision arrived. The highest hopes at that time conceived nothing beyond a 10 per cent. dividend; indeed, very few imagined that Parliament, under any conditions, would have sanctioned a higher. The coal market was steadying after a serious panic, and the 4s. 6d. per 1000 feet limit of price seemed a desirable margin to fall back upon for the maintenance of maximum dividends. The Board apparently decided that they were thus much safer than by adopting a lower initial price, above which a diminution of maximum dividends would ensue. They were probably frightened at what to-day would be considered a bugbear; they also probably disliked the auction clauses, which would have been a necessary accompaniment; and possibly there might also have been a very slight disinclination to follow the lead of another and a smaller Company. At all events they decided to await events.

Events have since declared themselves. The coal crisis can now be estimated, so far as the rise in price of gas necessary to maintain maximum dividends is concerned, and should the same difficulty have again to be encountered, it is, to say the utmost, not by any means likely that the 3s. 9d., or, in the case of the South Metropolitan, the 3s. 6d. rate will have to be exceeded. Are the Board of the London Company, therefore, justified in acting as if they considered the high limit of price under their present powers really a necessity? And are the improvements which are now being rapidly introduced not tending to lower the much more moderate initial prices which have by the other Companies been accepted? How is the London Company to stand in popular favour with a 3s. and a probable 2s. 10d. general rate over South London in their neighbourhood?

If a consideration of these questions has already (as it probably has) staggered their former resolution, or rather irresolution, and they wish to retrace ground, do they now expect a 3s. 9d. or even a 3s. 6d. initial price? If not, and they remain as they are, is the Shareholder to be for ever content with a 10 per cent. dividend, while other Companies divide 11 or 12 per cent., or even a possibly higher ratio of profits? The Shareholder in general knows that the market value of his stock to a great extent depends upon the dividend, especially if there is a probability of that dividend being maintained; and he also knows, or ought to know, that should the Gas Companies of London become the property of a Municipality, as under the existing Government is not beyond likelihood, the valuation for purchase will be based on a certain number of years calculation of the *legitimate divisible* revenue.

Recrimination is not always useless, but it is generally disagreeable. I have no wish to be disagreeable at all, but I cannot help being so to the extent necessary to prove my position. Viewed by our present lights, several Companies made the mistake of not at once adopting the sliding scale, as is evident from the higher dividends and superior value of stock of those Companies which did adopt it. The question of what is now to be done remains to be determined by the Board of the London Company—the only one, which may be properly called metropolitan, left out in the cold. No doubt they see, but hesitate to acknowledge, the position they have got into; and, as they know their strength as well as their weakness, probably the best policy now is to stir them up to do something, and to support them in doing it. That is the simple object of this letter. The writer believes valuable time is being lost. A bargain is inevitable, and the longer it is delayed the evidence seems pretty clearly to indicate that it will be less and less to the advantage of the London Company.

In conclusion, I have to explain that I desire, on the one hand, to avoid the appearance of attacking the Board under cover of a pseudonyme; and, on the other, any suspicion which might arise that notoriety was the principal aim of my letter. To those interested, therefore, should inquiry be made, I have no objection that my identity should be disclosed; but to the outside world, not especially concerned, I wish to be known only as

July 26, 1880. VIGILANS.

MR. METHVEN'S TEST FOR ILLUMINATING POWER.

SIR,—I cannot but regret that Mr. Lyon's evident desire to be brief should cause his expressions to be obscure, and therefore difficult to understand. His first communication somewhat puzzled me; but that contained in your issue of the 3rd inst. does so to a greater degree. I suppose it is intended to support the erroneous statements made in his former letter; but it really is of such a character as to leave a careful reader in doubt as to whether your correspondent has or has not changed his views in respect to the Methven standard.

Mr. Lyon describes, rather loosely, what he calls "the principle of the test," and proceeds thus: "I presume Mr. Hartley does not dispute the ability to find such an aperture." If by the word "aperture" he means the *slot* in the screen, and also the position of the slot in relation to the flame of the Argand which has been adapted, I answer, Certainly I do not; and that to ask my reply to such a question, after what I have said and written, is absurd. Following the above, Mr. Lyon continues: "But he [Mr. Hartley] disputes the flame from which that pencil of light passes." By this I understand that he means the particular burner which he used, to which and to the 7-inch chimney I did, and do still, object, because they are not what Mr. Methven accepts, and what he and myself employ. In addition, I may say that the loose and improper way in which Mr. Lyon conducted his experiments leads me to doubt whether the position which he elected for the slot, in respect to height and distance from the flame, were such as are necessary to prevent slight differences in flame length affecting the quantity of light passing through the slot.

In another paragraph Mr. Lyon quotes a passage from a letter which I wrote at the time when I believed Mr. Methven's project to be impracticable; but he has failed to realize the potency of the "If" with which the quotation commences. I am not disposed, however, to shield myself behind an "if," the more especially as I hold nearly the same views as I did when the cited passage was penned. It is *not* "literally true that slices (so to speak) cut out of the flames of different gases at a fixed distance between apex and base" are equal in illuminating power. As a matter of fact, however, there is a fixed position with the Argand flame of 3 inches length, where the difference in luminosity between the slice from rich gas and that from ordinary gas is so small as scarcely to be appreciable. Thus in my experiments the average readings with a slice of 14-candle gas was 7·20, and with 35-candle gas 7·225—a difference of 0·3 per cent.

Mr. Lyon says: "The candle is a common standard to the British gas consumer; but I submit Mr. Hartley is in error by opposing the light of it to the slice or pencil of light developed in a gas-burner.' Well, I was unaware that the candle standard was "common" to gas *consumers*, or that they were in the habit of using parliamentary standard candles. Consumers who burn sperm candles generally use those, as I am informed by makers, which burn at the rate of fully 140 grains of sperm per hour. But let this pass. Why, however, am I challenged with doing exactly the opposite to that which I actually do, and ask others to do? I do not want operators to waste their time in opposing a "pencil" or "slice" of light from a gas-flame to the light of a candle or that of a pair of candles. What I *do* want is that operators should use Methven's standard *instead* of candles, and so ascertain the power of the opposed flame by a constant, instead of by a variable standard.

In my former letter I asked these two questions: "Does Mr. Lyon mean that a 3-inch flame was in each experiment obtained with such extreme differences in the rates of consumption?" "Did he work with various lengths of flame?" Instead of giving an answer to each question, Mr. Lyon mixes the two questions together thus: "Are my experiments on the same gas but different heights of flame?" and replies: "I may say they are." Are what? The same gas? or different heights of flame? or both? The answer is incomprehensible.

Mr. Lyon is concerned that the proposers of new standards "do not challenge the abuse of the candles in the authorized box photometer." I reply, that while the Metropolitan Gas Referees have sought for a *new standard of illuminating power*, they have not, to my knowledge, raised objections to the box photometer, or to the "abuse," as Mr. Lyon calls it, of the candles in that instrument; and, unless the Referees express an adverse opinion, it is little use for others to do so. I may, however, remind Mr. Lyon that I have always been an advocate for stationary lights and a moveable disc in photometry, as well as the burning of both gas and candles in tolerably open spaces (see page 39 of my "Gas Analyst's Manual"); and I believe these conditions are absolutely essential to accuracy.

55, *Millbank Street, S.W., Aug.* 5, 1880. F. W. HARTLEY.

THE GAS SUPPLY OF NORWICH.—At the last meeting of the Norwich Town Council, held on the 27th ult., Mr. G. White brought forward the motion of which he had given notice, and which was as follows:—"Several months having elapsed since this Council requested the Parliamentary and Bye-Laws Committee to consider the legal position in which the Corporation stood with the British Gaslight Company, and considering the enormous interests at stake, the Council urges upon the Committee the necessity of at once reporting as to what steps (if any) they advise to be taken in order to relieve the citizens from the unjust and unnecessary burdens imposed upon them through the extravagant charge made for gas. The Council also requests the Committee, in making the report, to take into consideration the question of electric lighting, as lately adopted by several corporations." The motion, having been seconded, was withdrawn in favour of one proposed by Mr. Willis—"That in view of the proved injustice sustained by this city at the hands of the British Gaslight Company, it is desirable to take immediate steps to obtain relief, and that the Parliamentary and Bye-Laws Committee be accordingly instructed to obtain at once the most suitable legal advice as to the position of the Corporation with a view to the promotion of a Bill in Parliament for obtaining an independent supply, such Bill to take all necessary powers for the adoption of electric lighting if required." After a long speech by the mover of this latter resolution, it was put to the meeting and carried unanimously.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, Etc.

Session 1880.

Progress made to Saturday, August 7.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	Comns. Bill	June 25	July 5	July 15	July 20	August 2
" " " "	Commons	Feb. 9	Feb. 10	March 8	June 15	June 24	
Birkenhead Borough Bill	Lords	Bill with-	drawn.				
" " "	Commons						
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23	June 17	June 22	August 2
	Commons	Lords Bill.	June 24	July 5	July 20	July 28	
Burton-upon-Trent Corporation Bill	Lords	Comns. Bill	May 27	June 4	July 23	July 27	August 6
	Commons	Feb. 9	Feb. 10	Feb. 16	March 11	May 25	
Cardiff Water Bill	Lords	Feb. 10	Feb. 10	Feb. 20	March 8	March 11	June 29
" "	Commons	Lords Bill.	March 11	May 31	June 11	June 15	
Chester Gas Bill	Lords	Comns. Bill	March 12	March 19	June 4	June 8	June 29
	Commons	Feb. 9	Feb. 10	Feb. 24	March 2	March 11	
Cork Gas Bill	Lords	Bill with-	drawn.				
" "	Commons	Feb. 9	Feb. 10	March 1	June 18		
Cork Improvement Bill	Lords	Comns. Bill	June 25	July 5	July 15	July 19	August 2
" " "	Commons	Feb. 9	Feb. 10	Feb. 16	June 15	June 24	
Dagenham and District Farmers (Optional) Sewage Utilization Bill	Lords	Comns. Bill	July 9	July 16	July 23	July 29	August 6
	Commons	Feb. 9	Feb. 10	Feb. 17	June 15	July 8	
Dartford Gas Bill	Lords	Comns. Bill	July 13	July 23	July 27	July 30	August 2
" "	Commons	Feb. 9	Feb. 10	March 15	July 6	July 15	
Dearne Valley Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	August 2
" "	Commons	Lords Bill.	May 28	June 15	June 22	July 5	
Denton and Haughton Gas Bill	Lords	Comns. Bill	June 1	June 10	June 18	June 22	June 29
" "	Commons	Feb. 9	Feb. 10	Feb. 16	March 17	May 31	
Doncaster Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	June 29
" "	Commons	Lords Bill.	May 28	June 8	June 22	June 25	
Eastbourne Gas Bill	Lords	Comns. Bill	May 27	June 8	June 24	June 28	July 9
" " "	Commons	Feb. 9	Feb. 10	Feb. 25	March 12	May 25	
Edinburgh and District Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	Feb. 26	March 2	June 14
" " "	Commons	Lords Bill.	March 5	March 15	June 1	June 10	
Exmouth and District Water Bill	Lords	Comns. Bill	June 25	July 5	July 8	July 12	July 19
" " " "	Commons	Feb. 9	Feb. 10	Feb. 23	June 11	June 24	
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	Comns. Bill	July 19	July 27	August 3	August 6	..
	Commons	Feb. 9	Feb. 10	Feb. 17	July 9	July 19	..
Great Yarmouth Water Bill	Lords	Comns. Bill	July 6	July 15	July 19	July 22	August 2
" "	Commons	Feb. 9	Feb. 10	March 1	June 25	July 5	
Hinckley Local Board Gas Bill	Lords	Comns. Bill	July 8	July 19	July 29	August 2	..
" "	Commons	Feb. 9	Feb. 10	March 8	June 29	July 8	..
Huddersfield Tramways and Improvement Bill	Lords	Comns. Bill	June 25	July 5	July 8	July 12	August 2
" "	Commons	Feb. 9	Feb. 10	Feb. 16	June 14	June 24	
Hull Lighting Bill	Lords	Comns. Bill	June 29	July 9	July 19	July 23	August 2
" "	Commons	Feb. 9	Feb. 10	Feb. 16	June 11	June 28	
Hyde Gas Bill	Lords						
" "	Commons	Feb. 9	Feb. 10	Feb. 23	June 14	Preamble	not proved.
King's Lynn Corporation Bill	Lords	Comns. Bill	July 6	July 15	July 22	July 26	August 6
" "	Commons	Feb. 9	Feb. 10	Feb. 16	June 9	July 5	
Lancashire County Justices (Water, &c.) Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 13	June 29
" "	Commons	Lords Bill.	March 16	June 7	June 15	June 24	
Lancaster Corporation Bill	Lords	Comns. Bill	June 18	June 28	July 6	July 9	July 19
" "	Commons	Feb. 9	Feb. 10	Feb. 16	March 12	June 18	
Lincoln Gas Bill	Lords	Comns. Bill	June 22	July 6	July 13	July 16	July 19
" "	Commons	Feb. 9	Feb. 10	March 12	June 8	June 21	
Liverpool Corporation Water Bill	Lords	Comns. Bill	July 8	July 19	July 22	July 26	August 6
" "	Commons	Feb. 9	Feb. 10	Feb. 24	July 1	July 8	
Liverpool United Gas Bill	Lords	Comns. Bill	May 28	June 7	July 19	July 26	August 6
" "	Commons	Feb. 9	Feb. 10	Feb. 24	March 12	May 27	
London Gaslight Company Bill	Lords	Comns. Bill	June 29	July 8	July 15	July 19	August 2
" "	Commons	Feb. 9	Feb. 10	March 1	June 17	June 28	
Maidstone Gas Bill	Lords	Comns. Bill	July 2	July 12	July 15	July 19	August 2
" "	Commons	Feb. 9	Feb. 10	Feb. 23	June 22	July 1	
Malton Gas Bill	Lords	Comns. Bill	June 25	July 5	July 8	July 12	July 19
" "	Commons	Feb. 9	Feb. 10	March 8	June 11	June 24	
Oldham Improvement Bill	Lords	Comns. Bill	July 6	July 15	July 22	July 27	August 6
" "	Commons	Feb. 9	Feb. 10	Feb. 16	June 17	July 5	
Phœnix Gaslight and Coke Company Bill	Lords	Bill with-	drawn.				
" " "	Commons						
Portmadoc Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	May 31	June 3	August 2
" "	Commons	Lords Bill.	June 4	June 14	July 16	July 20	
Prescot Gas Bill	Lords	Comns. Bill	May 28	June 7	June 14	June 17	June 29
" "	Commons	Feb. 9	Feb. 10	Feb. 23	March 12	May 27	
Preston Improvement Bill	Lords	Comns. Bill	June 25	July 5	July 16	July 20	August 2
" "	Commons	Feb. 9	Feb. 10	Feb. 16	June 15	June 25	
Rathmines and Rathgar Township (Vartry Water Supply) Bill	Lords	Feb. 16	Feb. 16	March 11	June 7	Preamble	not proved.
	Commons						
Rathmines and Rathgar Township Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	June 7	June 14	August 6
Reading Gas Bill	Lords	Lords Bill.	June 18	June 29	July 20	July 30	
" "	Commons	Comns. Bill	June 29	July 8	July 15	July 19	August 2
Rochester Corporation Bill	Lords	Feb. 9	Feb. 10	March 1	June 17	June 28	
" "	Commons	Comns. Bill	July 9	July 23	July 26	July 29	August 2
Sea Water Supply to London Bill	Lords	Feb. 9	Feb. 10	Feb. 16	July 2	July 9	
" " "	Commons	Feb. 10	Feb. 10	Feb. 16	March 2.	Preamble	not proved.
Sligo Borough Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	June 11	June 15	August 2
" "	Commons	Lords Bill.	June 17	June 28	July 20	July 23	
South Metropolitan Gas Company Bill	Lords	Bill with-	drawn.				
" " "	Commons	Feb. 9	Feb. 10				
Southwark and Vauxhall Water Bill	Lords	Bill with-	drawn.				
" " "	Commons	Feb. 9	Feb. 10	Feb. 23			
Stafford Borough Bill	Lords	Comns. Bill	June 3	July 1	July 5	July 9	July 19
" " "	Commons	Feb. 9	Feb. 10	Feb. 23	March 17	June 1	
Wakefield Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 16	July 9
" " "	Commons	Lords Bill.	March 18	June 7	June 25	July 7	
Wandsworth and Putney Gas Bill	Lords	Comns. Bill	June 25	July 5	July 6	July 9	July 19
" " "	Commons	Feb. 9	Feb. 10	March 2	June 8	June 24	
Wigan Improvement Bill	Lords	Comns. Bill	June 25	July 5	July 19	July 23	August 2
" "	Commons	Feb. 9	Feb. 10	Feb. 17	June 11	June 24	
Wrexham Water Bill	Lords	Comns. Bill	June 22	July 1	July 2	July 6	July 19
" " "	Commons	Feb. 9	Feb. 10	March 4	June 11	June 21	
Yeadon and Guiseley Gas Bill	Lords	Comns. Bill	June 25	July 5	July 12	July 15	August 2
" "	Commons	Feb. 9	Feb. 10	March 10	June 11	June 22	

HOUSE OF COMMONS COMMITTEE.

THURSDAY, JUNE 17.

(Before Mr. ABEL SMITH, *Chairman; Mr.* H. B. SAMUELSON, *Lord* MORETON, *and Baron* HENRY DE WORMS; *Mr.* BONHAM-CARTER, *Referee.)*

CORK GAS BILL.

(Concluded from page 183.)

Mr. GRANVILLE SOMERSET said he would proceed with his evidence before addressing the Committee.

Mr. *G. W. Stevenson*, examined by Mr. GRANVILLE SOMERSET.

I have known Cork for many years, and was concerned for the Corporation of that city in opposing the Company's Bill of 1868, which resulted in an arrangement being made between the parties. I was also engaged in the case of the Provisional Order of 1873 before Mr. Vernon Harcourt, the Commissioner appointed by the Board of Trade. That application was made under the Gas and Water Facilities Act, 1873, for an increase in the price of gas, to enable the Company to pay a dividend of 5 per cent. They asked for 9d. per 1000 feet in addition to the price they were authorized to charge, and the Corporation proved—or thought they proved—that 3d. was sufficient; but the Commissioner reported that the Company ought to have an additional 6d., with which they paid more than the 5 per cent. they asked to be authorized to pay. In the present Bill the standard price proposed to be fixed is 4s. 6d. per 1000 feet inside the lighting limits, and 5s. outside; but I think the 4s. 6d. ought to be turned into 3s. 6d., and the 5s. into 4s., if there is to be a differential rate at all. I find it is not absolutely unknown to have two standard prices in an Act of Parliament, but I was under the impression, when I made my report to the Corporation, that it was unworkable.

Mr. MICHAEL said it was workable, but he would admit it was difficult, and had better be avoided if possible.

Examination resumed: I have analyzed the accounts of the Company for the year ending June 30, 1879, and I find that there was spent on coals £13,948, and received for residuals £10,502, so that the net cost of the raw material was £3446, being 3s. 2·36d. per ton of coals, and 5·30d. per 1000 feet of gas sold. The working expenses of the Company were £15,579, or 23·98d. for 1000 feet sold. To the gross sum of £3446 for coals, less residuals, I add £15,579 for working expenses, making together £19,025, and I divide this sum by the total quantity of gas sold during the year—155,900,000 cubic feet—which works out to 29·28d., to which I add the sum required for dividend and interest, £11,415, which is equal to 17·62d. per 1000 feet, making in all 46·90d., which is close upon 47d., or in round numbers 4s. per 1000 feet. But then I say, by conducting their works properly—that is, by making a proper quantity of gas per ton of coal, and reducing their leakage to a point which is quite possible and proper—they may save another 3·74d. per 1000 feet, and bring the net cost of coal at the consumers meters, including dividend and interest, down to 43·16d.; and inasmuch as their working expenses are very large—being nearly 2s. per 1000 feet of gas sold—I say the standard price of gas ought not to be more than 3s. 6d. per 1000 feet. The quantity of gas made per ton of coal is extremely small—only 8962 feet—while the usual make, not in London alone, but what is usual in this country, is considerably over 10,000 feet per ton. I am Consulting Engineer to Scarborough, Colchester, Peterborough, Ramsgate, and many similar places, where the make is 10,500 feet of gas and upwards per ton. I also say that the leakage is a great deal more than it ought to be. The bulk of the city of Cork is upon an island between two branches of a river, and is almost on a dead level, and the bulk of the consumption lies in this district. The mains that run into the outer districts can be very readily controlled by adopting a different plan to the one the Company have in use. Instead of going up and down hill, they could contour the line, and in this way place their governors on a gradually rising main; and as gas gains a pressure of an inch of water for every 100 feet of altitude, it is very easy to understand how to keep down the pressure. I had for ten years—from 1856 to 1866—the charge of the gas-works at Halifax, and when I went there the unaccounted-for gas was 29 per cent. I introduced street governors there, and reduced the amount of leakage to something less than 10 per cent. At the present moment it is under 9 per cent., and in that town the varying altitudes are, I think, about 800 feet; but there is nothing like that in Cork. I had also for several years the lease of the gas-works in Oporto, where the unaccounted-for gas was 40 per cent., but I reduced it to less than 20 per cent., and could have reached a lower point if I had had a permanent interest in the undertaking, which I had not. It is quite possible to bring down the unaccounted-for gas at Cork to within 10 per cent. It was 20 per cent., but has been reduced within the last half year to 15 per cent.; and the Company have nothing to do but to go on in their improving ways, and they will very soon have a great deal more gas to sell with less expenditure for coal. There is nothing peculiar in Cork to cause the necessity for such excessive leakage. London is tolerably flat, but at one period The Gaslight and Coke Company—then called the Chartered Company—used to lose about 14 per cent. of their whole make of gas.

Mr. MICHAEL: They did not lose the whole of that?

Witness: They absolutely lost it; it did not come to book. We call unaccounted-for gas anything which is not accounted for in the books of a company for money. A few years ago the unaccounted-gas in London was about 14 per cent., but the average is now 5·56 per cent., and some of the Companies are working so low as 3·42 per cent. There is also the neighbourhood of Birmingham, including a very considerable mining district belonging to Lord Dudley—who lets the land without any obligation to keep up the surface, and where the surface is continually falling in, and the mains are broken—which has no parallel in Cork; but even there the unaccounted-for gas over the whole of the district is under 9 per cent., while in the mining district by itself it does not exceed 12 per cent. Upon one portion of the district I have mentioned, however, the leakage was calculated at 15 per cent.

Examination resumed: The particular district I refer to is Tipton. There was an arbitration in respect to the sum to be paid by Tipton, West Bromwich, Oldbury, and Smethwick on taking the supply of gas into their own hands. The unaccounted-for gas in each district varies, but the grand total of the whole is 12 per cent. or thereabouts. A standard price has to be calculated to meet the exigencies of a gas company, and to give them their maximum dividend and the interest on their borrowed money, and if the standard price proposed in the present Bill be fixed, it will be simply giving the Cork Company a further amount for dividend which will be taken out of somebody else's pocket; and I therefore propose 3s. 6d. Even without the correction I think ought to be made, the price works out at something under 4s., taking the Company's own figures. I heard Mr. Anderson suggest that I had left out the sum which was put aside for depreciation, but I thought that fund came out of profits.

Mr. MICHAEL: Out of revenue.

Witness: Out of profits. They must make profits before they can set aside anything for depreciation. Revenue means income, and gross income has to bear the expenditure which is necessary to earn it.

Examination resumed: The money powers unexhausted are £36,000, and the Company propose to raise additional capital which will give them about £66,000; but they do not need additional capital at present, because they have plenty to go on with for at least six years. The true reason for coming to Parliament is that they may turn their 8 per cent. into 10 or 11 per cent., or even into a 12 per cent. dividend.

Mr. MICHAEL (in cross-examination): Do you agree with this:—"No objection can be made to the raising of the capital, or to the manner in which the Company propose to raise it, except in some small matters of detail which are set out"?

Witness: Yes, I do; but I do not say one word as to whether they require new capital or not. If they do, there is no objection to the amount; they might as well have double what they ask for.

Cross-examination continued: A standard price would not apply to a corporation at all, because when they manage a gas undertaking the limitation of profit which is required by the Gas-Works Clauses Act, 1847, is struck out, and the corporation do their business without any limitation of profit at all.

Mr. MICHAEL said that with reference to differential rates on the standard price in "Precedents in Private Bill Legislation, compiled by Mr. G. W. Stevenson," there were instances of such rates being sanctioned by Parliament, and he cited the cases of Bournemouth and Hemel Hempstead.

Witness: I confess I do not know how they work out.

Mr. MICHAEL: It shows that Parliament has adopted it, and that we are not asking for a new thing?

Witness: No; but, generally speaking, if Parliament sees a blot it is corrected.

In your calculation have you allowed anything for a reserve-fund?—I have not, because it does not go into the cost of gas.

Have you allowed anything for insurance?—No.

Have you allowed anything for depreciation?—Certainly not.

Have you allowed anything for bad debts and allowances?—No.

And yet, with all those omissions, you arrive practically at a sum of 3s. 11d.—that is, 46·90d.?—Yes.

That is under our bad system of working by using cheap coals?—Yes; mostly cheap coals. I know what Welsh coals are. I used to have works on lease at Tenby, and imported Newcastle coal all the way there.

You carried your London prejudices down to Wales?—No; I am not a Londoner, and have no London prejudices. On the contrary, I think London has a great deal to learn in many things.

Re-examined by Mr. GRANVILLE SOMERSET: Newcastle coal, wherever it can be had seaborne, is the best to be used, and is taken all over the world for gas-making. It yields the largest quantity of gas of good illuminating power, and it leaves the best residuals—good hard coke, and sufficient tar and ammoniacal liquor. I have heard that Mr. Anderson recommends it to the Cork Gas Company, but they do not use it.

Mr. *H. E. Jones*, examined by Mr. CLIFFORD.

I have, in order to give evidence, analyzed the accounts of the Company for the year ending December, 1879, and I say that, according to those accounts, the establishment of a standard price or a sliding scale of dividend at the rate suggested by the Bill, would inflict a hardship upon the city of Cork. The Cork Company are making large surplus profits at the present time, and are working extravagantly in several ways. Their cost of manufacture is too large; the leakage is too great, and they are not making so much gas as they ought to obtain from their coals; they are also getting rid of surplus profits, disguising them by carrying them to a number of small funds, most of which I think are not quite regular.

Mr. CLIFFORD: I find suspense account, £438; depreciation-fund, £700; bad debts, £348?

Witness: That is not bad debts merely; it is a reserve-fund for bad debts, put by to meet contingencies which may or may not happen.

Examination continued: I find roughly that they are now able to reduce the price of gas by something like 8d. per 1000 feet. They are charging 4s. 6d., which gives them 2s. 1d. profit, whereas I find that something under 1s. 5d. pays their dividend and interest. This leaves a margin of 8d. and a little more than a farthing, which provides first of all for the reserve-fund, £415; insurance-fund, £200; depreciation-fund, £700; suspense-fund for bad debts, £348; and a suspense-fund for meeting the defalcations, as it appears to me, of some former Accountant, £436; altogether amounting to about 6¾d. out of the 8¼d., leaving them somewhere about 1½d. of surplus profit beyond all those extra charges, which I must say present themselves to me as an irregular way of dealing with profit. From this point of view I am of opinion that the Company at present would be able to reduce the price of gas considerably without even reforming their management. With regard to leakage, I think the Company are losing far too much. Up to June, 1879, it was something like 20 per cent. I see by their last report they are aware it is excessive, and are renewing certain pipes and covering them with asphalte, and doing all they can to reduce their loss to a minimum. I now find the unaccounted-for gas is about 14·8 per cent. only, showing that they are already, without any suggestion from outside, largely reducing it. I do not think there are any special circumstances in the case of Cork to render this leakage essential or unavoidable.

By Mr. MICHAEL: I have never been in Cork myself; but I have taken the Ordnance map, which has the levels marked upon it in plain figures, and I find that, except for a ridge which runs along the north bank of the river, the average of the buildings are upon a moderate level.

Examination resumed: Having regard to the levels, I think the Company might bring the leakage down to about 10 per cent., and I know that in some irregular towns, so far as the levels go, it is below 10 per cent. At Wandsworth the works are on the level of the Thames, but the greater part of the buildings supplied are at great elevations, but the leakage for the past year was only 7 per cent. As to the cost of manufacture, I find that the Company have spent in wear and tear and in wages sums amounting to 8·18d. for the latter, and 6·92d. for the former—together, 15d.; whereas, unless the rate of wages in Cork and the surrounding districts is beyond what I can imagine, these figures should not be more than 6d. for wages and 4·5d. for wear and tear—together 10½d., or something like 4½d. less than they are. I am speaking from general experience, because these items fluctuate a little; but taking the case of these works, making something like 200 million feet of gas per annum, the rates I have mentioned are very fair. With regard to the production of gas from coal, I agree generally with what Mr. Stevenson has said. Welsh coals producing only 7000 feet per ton, cannot be worth using, and I think the Company are working very badly indeed in buying them. The wiser course would be, if Newcastle coal comes to no more than 3s. per ton extra, to use that coal alone, from which they would produce gas of 14 candles illuminating power, and extract from 10,000 to 10,200 cubic feet per ton. Having regard to all the circumstances of the case, I am of opinion that the Company could sell gas at 3s. 6d. per 1000 cubic feet, allowing for all the usual charges. I would, however, prefer that they should have a small margin over this, and I would allow 2d. for fluctuations which occur from time to time. I should consider 3s. 8d. would therefore represent a very fair price for a sliding scale standard in Cork. In arriving at this conclusion I have already added 2s. per ton above the price now paid for coal, and have taken it at 15s. instead of 13s. I also think the increase in gas consumption will continue, and so enable the Company in the future to reduce the cost of production, and thus make more profits. Having regard to the

circumstances of the Company, I do not think they require additional capital. They are a long way from having exhausted the powers they already possess; and the amount now applied for is very much out of proportion to what they ought to have. They have already raised £150,000, and therefore the £25,000 asked for does not represent sufficient money to carry them over for any length of time, except for the balance they have remaining uncalled up. If they had exhausted all their capital, and were applying for more, as they profess to be doing, they would have asked for another £150,000, to carry them over a fresh term of ten years. I should think their present unexhausted capital will last them two or three years, but I have not specially gone into this question. Looking at the absence of apparent motive for applying to Parliament, and looking to the amount of surplus profits, I am of opinion that the effect of obtaining the Bill would be to confer a 10 per cent. dividend immediately upon the Company.

Mr. CLIFFORD: Perhaps that explains the opinion expressed by Mr. Lane, that by the 1st of January the gas would be lowered in price?

Witness: Yes; and it also confirms my view that the Company would at present be able to make a reduction.

Examination continued: Assuming the result of the Bill to be to make the Company a 10 per cent. paying Company, the effect of such a provision upon the clause enabling the Corporation to purchase must be to increase the purchase-money by 25 per cent.; but I am not aware that a purchase is imminent.

FRIDAY, JUNE 18.

Mr. *Jones* recalled, and cross-examined by Mr. RICHARDS.

I am not aware that Mr. Harcourt, who sat as an impartial judge, allowed 15 per cent. for the leakage. In my scheme I have not made any allowance for a reserve-fund, because I do not consider it necessary to be charged every year. I have not, in my estimate, made any allowance for insurance, because I do not consider it to be a legitimate reduction in addition to a reserve-fund. I have not allowed anything for depreciation, but I have allowed for wear and tear a sufficient charge on the gas to renew as well as repair the works. I have, however, made an allowance for bad debts. In my figures I have not compared London with Cork, although I have arrived at a result similar to Mr. Stevenson; but I have allocated to the different charges for manufacture a rate which, according to my experience, will be just. I do not consider it to be absolutely fair to institute a comparison between Cork and London.

Mr. RICHARDS: Can you conceive two places which it is more ridiculous to compare?

Witness: Yes, because in London we have the disadvantage of paying the very highest rates for wages and for manufactured iron goods.

Cross-examination continued: For a comparison I would rather go to a company making gas on a small scale—say, 200 million feet a year.

Mr. RICHARDS: Would you not also go to one dependent on coal-fields situated as near as may be in the same direction?

Witness: Yes; but I may say my evidence is based on other grounds—viz., upon the gas sold, and not upon the gas made, which is the most convenient mode of dealing with the matter.

Cross-examination continued: All companies with which I am connected charge a rent for their meters. It amounts to about 1d. per 1000 feet. Any extra tax in a city like Cork must be taken into consideration, because the rates and taxes paid by the Company there are nearly twice as high as I have previously seen; but I believe there is a probability of an abatement in future, which will enure to the benefit of the Company. In my estimate, however, I have accepted the figure they are now paying. The adoption of the sliding scale would confer a mutual benefit, but it would be larger to the consumer than to the shareholder.

Mr. RICHARDS: You are quite right; it is very much larger to the consumer—that is to say, the reduction of 1d. to the gas consumer may amount to £5000 a year, whereas a quarter of that may be added to the dividend, or only about £1200?

Witness: Yes.

Cross-examination continued: I have no hesitation in saying that the sliding scale is a good thing, provided that the initial price is carefully considered, and this does require very careful consideration. In one part of London the standard price is 3s. 6d. per 1000 feet, and in the case of The Gaslight and Coke Company it is 3s. 9d.; and I think in Cork it would be fair to adopt a scale of 1d. under the latter price, bearing in mind that the dividend in Cork is 8 per cent., and not 10 per cent. With regard to residual products, Cork has a great advantage over London. A larger amount of these residuals is produced in London than in Cork, but there is no great sale for them, while in Cork a large sum is obtained for them. I quite agree that the larger the scale of manufacture the cheaper should be the fixed charges, such as salaries and management, and I have therefore allowed 3½d. in Cork, whereas in London the amount is not more than 3d.; but a ton of coal will not make more gas in Cork than in London. I have not come here to say whether a dividend of 8 or 10 per cent. is best, but the Cork Company have accepted 8 per cent., and I think it ought to remain at that figure.

Mr. RICHARDS: There is no proposal to do otherwise than remain at 8 per cent. so long as we remain at the initial price. There is no direct proposal to alter the price of gas and the dividends of the shareholders?

Witness: There is no direct proposal, but I am afraid if this Bill passes it will lead to that.

The effect would be that there might be a rise in the dividend, but then there would be a corresponding reduction in price?—Yes; but then you have a quantity of surplus earnings, which have accumulated altogether to £15,000, and you are continuing those earnings; it is therefore obvious to me that you could reduce the price very largely, and share the extra dividend.

Is it not out of those surplus earnings, and those alone, that we can have any possibility of reducing the price?—No; there is always the chance of your reducing the scale.

By "surplus earnings" you mean the reserve-fund?—No; you have of late years charged a large amount of money to a variety of funds.

Re-examined by Mr. CLIFFORD: Under the present Act of the Company, so soon as the legitimate reserve-fund is full they must reduce the price of gas; it is not optional. The effect of the present Bill would be to offer an equivalent to the consumer, but with an additional satisfactory dividend to the Company. In my estimate I have not made any allowance for increased residuals derivable from increased consumption of gas; I have given them the benefit of this in the future. Of course as the Company go on increasing their business, as we are told they are doing considerably, the proportion of capital to the amount of business gradually becomes less, and the dividend on the capital follows the same course, and in this way they will be able to supply gas cheaper. The improvement of a company's circumstances by the operation of increased consumption from time to time is to be noted all over England. It is from this cause that the price has been reduced from 10s. per 1000 to the present price in London; and to the advantage of this economical working the consumers are, of course, clearly entitled. My report was founded upon comparisons between provincial and suburban companies more on a scale comparable with the Cork Gas Company than a large London Company would be, and I do not believe there are two figures in my valuation, as it is prepared in detail, which correspond with those of Mr. Stevenson.

Mr. NAGLE: Is not the consumer better protected by the adoption of the sliding scale than by the procedure of the Gas-Works Clauses Act?

Witness: Yes; so long as the initial price, upon which the whole thing turns, is very carefully investigated before it is settled.

A MEMBER of the COMMITTEE: In your estimate of 3s. 8d. per 1000 feet, do you take into consideration the question of meters, because, as I understand, the Company supply meters without any charge?

Mr. SOMERSET said this was the case.

A MEMBER: Is that arrangement to be discontinued?

Mr. NAGLE: No; we only seek to be relieved from the obligation where the meter does not produce anything—where there is no consumption from it.

A MEMBER: You apply for further powers with regard to the sale of apparatus; does this include gas-meters, because you have made a considerable point of the fact that your Company do not charge for meters, whereas all other companies do charge, and therefore some allowance should be made in this respect in favour of the promoters?

Mr. SOMERSET: All other companies do not charge.

A MEMBER: It all depends upon the circumstances of the case, whatever the price might be, or whether the Committee thought the Company might put on a gross price, including the meters.

Mr. SOMERSET: I distinctly put the question whether, in his estimate of initial price, the witness had taken the meters into consideration?

Witness: I have taken into account the cost of repairing and renewing meters; but mine is an expenditure account, and not an estimate of revenue. I have not set out that the effect of charging a rent would add another penny to their receipts, which would therefore go into their pockets altogether beyond the price of gas.

At the same time, if they give a thing away, they must be allowed for it to some extent?—Meters are not things involving much capital. It is a question of interest on capital more than anything else, because I have allowed them the expense of keeping them up.

Mr. NAGLE: Have you allowed for new meters?

Witness: Yes.

A MEMBER of the COMMITTEE: Do you know whether the Bill continues or discontinues the arrangement by which a consumer is provided with a meter free of expense?

Witness: It admits the present arrangement to go on excepting in cases—which appear to be somewhat reasonable—where the consumer does not burn much gas. If he does not burn 5s. worth of gas in the six summer months, for that time the Company should be allowed to charge a rent for the meter. It would only apply in the case of small consumers.

Mr. *Alfred Penny*, examined by Mr. GRANVILLE SOMERSET.

I have carefully examined the accounts of the Cork Gas Company for the half years ending Dec. 31, 1878, and June 30, 1879, and I have eliminated from those accounts certain items. I find there is an absolute profit of £7445 16s. 4d. for one half year, and £6769 11s. 9s. for the other half year. That profit is produced after every single item of expenditure has been taken into account, leaving a sum of £14,215 8s. 1d. as the amount of profits, out of which must be paid the statutory dividends, amounting to £10,832, on a capital of £135,400, being a surplus profit of £3383 8s. 1d. I merely make a proportion sum of that, and I find, taking the quantity of gas sold and the surplus profit, it leaves a balance representing 5·20d. per 1000 feet sold. There will also be a saving in the cost of the gas of 3·74d. by making 10,000 feet per ton of coals, and by reducing the leakage to 10 per cent., and selling or bringing to charge 9000 cubic feet of gas per ton of coal carbonized. All the figures I have taken are those of the Company, and I make no abatement for any supposed want of economy in the management.

Mr. MICHAEL: I thought you said you had eliminated something?

Witness: Yes, I have; but for the reason that the particular form of the Company's accounts—which I believe they are not responsible for—does not bring into revenue sums which ought to be charged to it.

But that is not eliminating?—It is eliminating from the profit and loss account, and adding to the expenditure account.

Mr. MICHAEL: That is quite right, and I objected yesterday that Mr. Stevenson had not done so.

Examination resumed: In my statement with reference to the revenue account for the half year ending Dec. 31, 1878, the first item is "Profit and loss, as per Company's balance-sheet, £8294 4s. 6d." I say that this balance of profit is too much, because the Company have not brought against revenue certain charges which have been carried to profit and loss, but which ought to have appeared in the revenue account. The first item is "Sundry charges"—I do not know what they consist of—"£172 9s. 7d." Then "Insurance, £36 19s. 9d.;" "Law expenses, £20 11s. 3d.;" "Bad debts and allowances, £147 3s. 2d.;" and "Debenture and bank interest, £471 4s. 5d." Those sums added together amount to £848 8s. 2d.; and I conceive all those items ought to have been charged to revenue account before the gross profit is arrived at. This, by my process, brings the balance of profit for the half year down to £7445 16s. 4d. I do the same thing with the next half year's accounts, taking £478 13s. 3d. for sundry charges; insurance, £54 3s.; law expenses, £4 2s. 2d.; bad debts and allowances, £48 18s. 11d.; and debenture and bank interest, £469 13s. 6d.; which together produce £1055 10s. 10d.; and reduce the net profit in that half year to £6769 11s. 9d. Then I add those two net profits together, which produce £14,215 8s. 1d.; and by taking off the dividend on the share capital, £10,832, it leaves the sum of £3383 8s. 1d., which I have previously spoken of. There is also one other sum of 37·4d., which I have arrived at in the way the Committee have already heard. I assume that well-conducted gas companies are capable of making 10,000 cubic feet of gas for every ton of coal they use, and if they employ proper care in attending to the mains and pipes they ought to sell about 9000 feet. I therefore say there will be first a sum at the disposal of the Company of 5·20d. for excess of profit, and that they can save 3·74d. by reducing the leakage and increasing the make of gas. I will now give the figures that produce the standard price, and again I take the accounts of the Company—cost of coal, £13,948; less residuals, £10,502. The sale of gas amounts to 155,900,000 cubic feet, and the net cost of coals to £3446, which works out to 5·20d. per 1000 feet. The working expenses are £15,579, or 23·98d. per 1000 feet; and it is necessary that I should add the item of "sundry charges in profit and loss account, omitted in revenue account," amounting to £1291, or 1·98d. per 1000 feet; and also the dividend and interest, £11,445, or 17·62d. per 1000 feet. This brings out a total of £31,761, or 48·88d. per 1000 feet of gas sold. I wish, however, to deal fairly with the Company, and I add for the possible increase in the price of coals 18d. per ton on 17,322 tons, which quantity is sufficient to produce, at 10,000 feet per ton, the quantity they sell. This amounts to £1299, or 2d. per 1000 feet in addition to the 48·88d., and I say that 18d. per ton provides for using Newcastle coals entirely. I know something of Welsh coals, and I do not think they can be used so economically as Newcastle coals. However, this 2d. per 1000 feet gives something for the increased cost of coals, and this brings the price up to 50·88d. Now I have to make a deduction from that of £3383, produced by the sale of gas at 4s. 6d. and 5s. per 1000 feet, which amounts to 5·20d. per 1000 feet; and also for improved working in

selling 9000 feet of gas per ton of coal carbonized, 3·74d. per 1000 feet. Those two sums together amount to 8·94d., which, deducted from 50·88d., leaves 41·94d.

A MEMBER of the COMMITTEE: I do not understand that last item—"Improved working in selling 9000 cubic feet"?

Witness: I venture to contend that the Company's sale of gas is small compared with what it might be if they reduced their leakage, and the make of gas is small as compared with what other companies, with no better capacity, are doing; and therefore I say that, by fairly good working, they may increase their divisible profits by 3·74d. Then I add that to the 5·20d., which comes out in their accounts as before described, and this produces 8·94d., and leaves the standard price of gas, as shown by these figures, at 41·94d. I consider, however, that it would be a fair and proper thing to add to this something for contingencies which may happen—I do not know what they may be, but there are all manner of things which may arise in connection with the working of a gas establishment—and, therefore, I allow an additional sum of 3·06d., which will increase the price I have brought out to 3s. 9d. per 1000 feet sold as a proper standard price. The addition to the 49·94d. of the 3·06d. represents a sum of £1987.

Mr. SOMERSET: Supposing your view to be adopted, what percentage of dividend should the Company be able to pay, supposing the Bill passes?

Witness: If the price inserted in the Bill is passed by the Committee, they will at once be able to divide 1½ per cent. extra—that is 9½ per cent.—without any reference to the economies which might ensue through the increase of gas made, and the consequent increase of gas sold.

Mr. MICHAEL (in cross-examination): Look at the fallacy you have just committed. Before they can divide this amount they must take 6d. off from the price of gas, and how much will that reduce the profits?

Witness: For every penny they take off, £650; or, in round numbers, a total of about £3954.

Will not that at once reduce the profit below 8 per cent.?—No; I explained that to enable this to be done the leakage must be reduced to 10 per cent., which it is quite possible to do.

Did you not state to the Committee that the moment the Bill was passed the profit made by the Gas Company would be 9½ per cent.?—Subject to their doing what I say they can do.

You are sufficiently candid to acknowledge that profit cannot be earned unless there are great changes?—I acknowledge that they have, according to the present working, only £3383 to enable them to reduce the price by 6d., which would not give them 1½ per cent. more dividend, but this sum alone would give them 1 per cent.

Have you made any allowance for an insurance-fund?—Certainly not. I have made my calculations on a standard price which shall be necessary to pay all the expenses of making gas and providing the statutory dividend. Now, as this dividend is going to slide backwards and forwards, any sums that are to be put into the reserve-fund and to the insurance-fund cannot arise until the Company obtain a profit over and above the sum which will be produced by the sliding scale and the standard price.

According to the new state of things it is provided that 1 per cent. may be laid aside for the reserve-fund and 1 per cent. for the insurance-fund?—Yes, if you can make it.

Before it can be laid aside it must be made out of profit, and therefore such a price must be provided as will enable it to be done?—I do not interpret the clause in that way.

Where else can it come from?—Out of the sum the Company will receive by increased care and skill in carrying out their operations.

In your statement, taking the old accounts, in seeking to compute what the surplus profit would be, after paying 8 per cent., you made no provision for a reserve-fund?—Under the old circumstances, if the reserve-fund was not full, the Company could have taken every shilling of that £3383 and added it to this fund before being compelled to decrease the price of gas.

As the Company supply meters gratuitously, must there not be a depreciation-fund to meet the expense of their maintenance?—Ordinary wear and tear is supposed to cover everything, because if a meter is put up in the year 1, in the year 100 it will be still there, or another to represent it. Every year a sum is spent in maintenance, which will repair this meter as long as it is good enough to repair, and replace it when it is dead.

With regard to coal, your assumption is 10,000 feet of gas are obtained from Newcastle coal. What difference is there in price?—I obtained the figures from the Accountant: 13s. 9d. one half year; 13s. 4½d. another; and 13s. 6¾d. another; which brings the average cost of Newcastle coal to 13s. 7d. For Welsh coal the average is 10s. 10d.

Was not that 13s. 9d. the average price of the coal used on the works?—No; it was under 13s. I have taken 12s. 11¾d. as being the mixture of a certain proportion of Newcastle and Welsh coals; the same as the Company have used.

You have made no allowance for the difference in order to obtain your 10,000 feet, using Newcastle coal?—Indeed I have; I have added to it 1s. 6d. a ton.

I thought that was for possible increase in the price of coals?—No; a portion of it was for the present increase by using Newcastle coals, and something for future increase in price.

But Newcastle coals cannot be bought for 14s. 6d.?—If they could not they can be, if the Accountant's statement is correct.

Have you allowed anything for probable increase of freight and expenses?—I have allowed 9d.; I have divided the 1s. 6d. into two.

This is very much less than the absolute increase, using Newcastle coal at present?—I cannot say that, when the absolute average is 13s. 7d. for the last three half years.

I suppose you agree that there never has been a time when gas has been produced so cheaply as at present, but that a change may occur?—Yes; it may.

Yet you are asking that the Company should be placed in a position in which the case is entirely exceptional, and make that cover all their future life?—If I had not allowed something for contingencies, I should be open to that observation; but as I have added £2000 to their profits—represented by 3·06d.—I think I have endeavoured fairly to meet the case.

What are the circumstances with regard to Cork which render it different from Londonderry?—One thing is that in Cork the dividend is limited to 8 per cent., which is a considerable element in fixing the standard price, because a less amount is required to pay it. If I had to calculate these dividends at 10 instead of 8 per cent., my standard price would necessarily be higher.

You have said that the leakage can be reduced to 10 per cent.; do you, as a Gas Engineer, say there is the same ease in reducing the second 5 per cent. as there is in the first 5 per cent?—No; but I say it can be done all the same, and 10 per cent. is now considered a high rate of leakage—or at least a normal rate.

What do you say about the average meter-rent per 1000 feet of gas consumed?—The real question is not what they pay, but what they will obtain as profit. The profit made by the whole of the London Companies in 1878 amounted only to the fifth part of a penny per 1000 feet sold.

That has nothing to do with the charge here. We save a certain amount of meter-rent, which must be an amount unless we have a loss?—I may answer that by saying it is in the Company's accounts; and whatever loss there is it still leaves £3383 profit.

After the deductions I have brought to your notice—reserve-fund and other matters?—Yes.

What is about the cost? May I take it at 1½d. per 1000 feet?—No; I should think about 1d. or 1¼d.

I have had the result worked out for me—if no further capital were raised—that the Company could pay 9½ per cent. as soon as the Bill is passed?—But this is all a deduction, and 3·74d. is saved. It is always on that assumption, as I have stated to the Committee, I begin with.

Would not this necessitate a reduction in the price of gas of £4200?—Roundly it is £3900 odd.

Next year it will be £4200, owing to the increase of consumption after the Bill is passed?—I assume that the consumption will go on increasing, and the profit per 1000 feet will go on increasing, and this will provide, to some extent, for any increase of capital that may be necessary.

How much does 1½ per cent. dividend require?—£1950 on £135,000.

That is £650, and then 1 per cent. insurance, £1350?—If you put that in which I have not admitted.

You have told the Committee that if the Bill passed—and I am following it out as passed—the insurance would be £1350; reserve-fund, £1950; making a total of £8850 required to make good your statement?—I am content, for the purpose of my argument, and if you tell the Committee I am wrong, I am wrong to that extent; but in my view they cannot lay aside a reserve-fund or an insurance-fund except out of profits made outside the standard price.

But if they like to be content with 5 per cent., and made 6 per cent., they could then put aside the insurance and reserve funds?—Certainly, if they like to do that.

Then you entirely deny this contention?—No; I am giving them 8 per cent. upon their old capital—the same as they have been paying hitherto.

I say you are erroneous in your conclusion. You have £3380 to meet £8850?—No; I have £3380 *plus* the 3·74d. to meet a sum which will be required—viz., £4000.

There is the 6d., £4250, and 1½ per cent. to pay the additional dividend, £1950; that is £6000 at once. Do you agree to that?—Yes; in round numbers it is so.

It requires £1950 to do that?—Yes; *plus* the saving. The sum is £2312. That is £8512.

The £3954 you agreed to, and the £1950 for the 1½ per cent.?—Yes.

And 1 per cent. for the £1350?—No; I do not agree.

But you must take my figures?—I will add up mine first. I shall have £5812 to provide the money to pay £5931.

And have a reserve-fund of £1350 and an insurance-fund of £1350—a deficiency of £2700, according to your own figures?—I do not follow you there. There is at the present moment a sum of nearly £14,612 which may go to the reserve-fund, and therefore they cannot want, and would not be authorized to lay by 1 per cent. in addition. The reserve is £10,821; depreciation, £1981; insurance, £1800; making nearly £15,000; and I contend that, under the provisions of the Act which now governs the Company, they have no right to a depreciation or insurance-fund; but I admit they are entitled to make 10 per cent. upon their capital for a reserve-fund. They might, therefore, just as well have carried all those sums to the reserve-fund, which I venture to say is practically full.

By the COMMITTEE: Depreciation is caused by allowing the plant to go down; maintenance means not repairing alone, but keeping everything up to its proper standard. Maintenance is paid for out of revenue, and that means depreciation as well. The object of the reserve-fund is to allow the Company to equalize their dividends in the event of any contingencies arising, such as an advance in the price of coals or a strike. Many companies, from one cause or another, have no reserve-funds at all; they reduce the price of gas too soon, or they have pressure put upon them. If, however, they stand upon their rights, there is no doubt they can, before being compelled to reduce the price of gas, fill up their reserve-fund; but they are not obliged to do so. The insurance-fund is to provide for accidents that might happen out of the ordinary way—the destruction of a gasholder, for instance, or something of that kind. This fund can only be drawn upon by the Company going to a Justice of the Peace, and proving to his satisfaction that some calamity had happened to them.

This concluded the case for the opponents of the Bill.

Mr. GRANVILLE SOMERSET then addressed the Committee on behalf of the Corporation of Cork, and Mr. YOUNG on behalf of the consumers.

Mr. RICHARDS having been heard in reply,

The committee-room was cleared. Upon the Counsel and parties being called in,

The CHAIRMAN declared the preamble proved, the standard price to be 4s. within the city and 4s. 6d. without.

The clauses were then proceeded with and agreed to, with amendments, and the Chairman was directed to report the Bill to the House.

[The Company have since withdrawn the Bill.]

REPORT FROM THE SELECT COMMITTEE ON LONDON WATER SUPPLY.

THE Select Committee appointed to inquire and report as to the expediency of acquiring on behalf of the inhabitants of London the undertakings of the existing Metropolitan Water Companies; and also to examine and report whether certain agreements, or any of them, already entered into provisionally for the purchase of these Companies, would furnish a satisfactory basis for such an acquisition; and further to inquire and report as to the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same; have considered the matters to them referred, and have agreed to the following report:—

1. That it is expedient that the supply of water to the Metropolis should be placed under the control of some public body, which shall represent the interests and command the confidence of the water consumers.

2. That under such management a greater efficiency, economy, and equality of charge than that which at present exists might be secured, the defects in the present provision for the extinction of fire might be remedied, and better provision might be made for the health of the community.

3. That in order to effect the above-mentioned objects, a Water Authority for the Metropolis should be created, with statutory powers, which will enable such body to acquire and utilize, so far as may be deemed expedient, existing sources of supply, and to have recourse to such other sources of supply as, upon investigation, may prove to be available and desirable.

4. That in the absence of any single municipal body to which these functions could be committed, a Water Authority of a representative character should be constituted, and that a Bill having that object be introduced at an early date by Her Majesty's Government. Without absolutely prescribing the composition of such a body, your Committee are of opinion that it should include elements to be derived from the Corporation of London and the Metropolitan Board of Works, together with a due

representation of the districts, at present supplied by the Metropolitan Water Companies, which lie beyond the jurisdiction of the Corporation and the Metropolitan Board. It is on such a body, when properly framed, that, in the opinion of your Committee, should devolve the responsibility of determining questions affecting the source, the nature, and the price of the Water Supply of the Metropolis. The subject is one which especially concerns the consumers of water, and should be left to the judgment of a representative body furnished with adequate power to give effect to such measures as, on mature consideration, may be determined.

5. That for certain purposes, at least, it would be desirable to acquire the undertakings of the existing Companies, if the same could be obtained upon fair and reasonable terms.

6. Your Committee have investigated the terms negotiated for such a purchase in the agreements referred to them, which were provisionally concluded between the Metropolitan Water Companies and Mr. E. J. Smith. The amount of immediate annuities to be paid under the agreements is £773,451. To this would have to be added deferred annuities, to accrue by way of increments at various intervals, amounting finally to £325,499, making an ultimate annual payment of £1,098,953. The value of the immediate annuities in 3½ per cent. stock, taken at par, would be £22,098,700, and Mr. Smith estimated the present value of the deferred annuities at £6,851,300, making the total value of stock under the agreements £28,950,000. If the deferred annuities had been capitalized at 3½ per cent., the total amount would stand at £29,734,281. In addition to this, it would have been necessary to make provision for the debt charges —viz., preference and debenture capital, amounting to £3,061,500, bearing an actual annual charge for interest of £133,913, and also for the bond and mortgage debt, £223,055, with an annual charge for interest of £7807. These interest charges Mr. E. J. Smith calculated would, as well as the annuities, be covered by the income of the Companies when transferred under the agreements. Adding these charges to the total of the annuities granted as above, the annual payments would have been finally £1,240,673, and the total capital value would have stood at £33,018,836.

Value of annuities	£29,734,281
Preferential and debenture capital.	3,061,500
Mortgage and bond debt	223,055
Total	£33,018,836

These agreements were founded on the principle of paying so much in the way of immediate annuities, in consideration of the existing net income of the Companies, and so much by way of deferred annuities, in regard to the anticipated increase from year to year of their revenue. The present net income of the Companies is a figure which is capable of being accurately ascertained and adjusted. It is admitted that the immediate annuities to be granted under the agreements were in excess of the actual net income realized in any year of which we have completed accounts. Mr. E. J. Smith, however, alleged that the annuities he proposed to grant would be met by his estimate of net income for the year ending June 1, 1881. But the question of the future increments is a matter, to a great degree, of estimate and speculation. Their amount must depend on numerous elements, which it is only possible to conjecture, such as the future rate of the growth of houses, and the probable increase in their value; the future rate at which the water-rentals are to be fixed; and the future capital which it may be necessary to expend. These are the elements from which the growth of the past has been compounded; whether they will increase or decrease, or remain stationary hereafter, is altogether uncertain. It seems that the calculation of increments on which the agreements proceeded was founded on the assumption that all the items of receipt would grow at a greater rate in the future than in the past; that the number and value of the houses, and the rate of the rentals, would perpetually augment; but that, on the other hand, the growth of capital expenditure, which has hitherto been required in order to earn an increased income, would sink almost to nothing, and might be discarded from the calculation. This does not appear to be a sound basis of a financial estimate for the future. In the investigation before your Committee, the Corporation of London and the Metropolitan Board of Works have taken part. Those two bodies, on behalf of the water consumers, whom they may be taken to represent, have declared to your Committee their opinion that the terms contained in these agreements do not furnish a satisfactory or admissible basis of purchase; and in that opinion your Committee concur.

7. In the resolution communicated to your Committee by the Corporation of London, it was stated that the price agreed to be paid under the agreements to the Water Companies was nearly £9,000,000 in excess of the market value of the property at a period immediately previous to the commencement of the negotiation. As a general rule, the market value of stocks of this description affords the best estimate, not only of the present, but of the prospective value of the commodity. The expectation of future improvement is an element which always enters into the consideration of the market value. It was, indeed, suggested that, in the case of the Water Companies, their affairs were not sufficiently well known to the public to enable a complete judgment of their value to be formed, and that their future expectations were not sufficiently estimated. But during the past six months every possible light has been cast upon their affairs, and yet their market value is, at the present time, with a complete knowledge of their condition, still some millions below the price which was payable under these agreements. The value of the shares rose immensely on the disclosure of the terms of the agreements; they fell as soon as it was considered doubtful whether the agreements would be sanctioned; but at no time did they ever rise to the full value which would have been due to them if the agreements had been carried into effect. It is obvious, therefore, that the judgment of the public, as evidenced by the market price, coincides with the opinion of the Corporation of London and the Metropolitan Board—viz., that the price offered in the agreements is greatly beyond the estimated value of the property.

8. Your Committee are further directed to inquire into "the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same." It is admitted that rates have been raised in recent times under the statutory powers of the Companies, and the evidence shows that a considerable portion, at least, of the increase in the receipts of the Companies has been due to this cause, as the increase per cent. in the net water-rentals for the last eight years has been, in the case of most of the Companies, greatly in excess of the percentage of increase in the number of houses.

9. The Companies claim the right still further to increase their rates in proportion to the growth in the value of houses, and this right would have no legal relation to the augmentation in the quantity or improvement in the quality of the water supplied. If the Companies were limited in the amount of dividend they could earn, as was contemplated by the Water-Works Act, 1847, there might be some reasonable restraint on their power to enhance the charges against the consumer. But the Companies assert their right, under the title of back dividends, to escape from any such limit. Indeed, their right to do so is made one of the grounds for demanding so large a price from the public for the purchase of their undertakings. The calculations on which the agreements were founded proceeded to a considerable extent on the assumption that the claim of the Companies to back dividends was established. In the evidence of Mr. Smith the possible amount of such dividends is estimated at nearly £20,000,000. The Counsel for the Companies contended before the Committee that the right to such dividends might be carried back to the origin of the Company, which accounts for the astounding figures given in the case of the New River Company of £15,000,000 as the amount of back dividend. The Counsel for the Corporation and the Metropolitan Board of Works maintained, on the other hand, that no question of back dividend could arise till the Act which introduced a limit came into force. Without pronouncing an opinion on the legal point, your Committee must observe that if the contention of the Companies is well founded, the population of the Metropolis and its suburbs, amounting to 4 millions of people, would be left at the mercy of certain trading Companies, armed with the power of raising the price of one of the first necessities of life to an extent practically without any limit—a situation from which the Companies seem to consider there is no escape, except in the purchase of their undertakings at such a price as they may be willing to accept. If that were the only remedy, the consequences to the consumer of the improvident legislation of the past would be indeed intolerable. But Parliament is not unequal to redress such mischiefs to the public interests. The manner in which the Gas Companies have been dealt with by Parliament may be referred to in illustration of the methods by which a remedy for such a state of things may be effectually provided.

10. Your Committee have not had before them any specific scheme for an independent supply of water, and general speculations on the subject are of little value without detailed plans of the sources from which it is to be derived, and the cost of carrying it into effect. But your Committee would observe that the total cost of the existing water supply to the Metropolis has not much exceeded £12,000,000, a considerable portion of which sum may be attributed to works which have become useless or have been reduplicated. And it would become the duty of the Water Authority, when constituted, carefully to consider, with the professional assistance which will be at their disposal, whether a new and better supply could not be obtained at a cost greatly less than the sum which would have had to be paid under the agreements for the existing supply.

11. In the constitution of the Water Authority, your Committee would recommend that that body should be entrusted with the largest discretion as to the best method of dealing with the Water Supply of the Metropolis. Various courses might be adopted. It would be possible to proceed by regulation of the powers of the existing Companies, as in the case of the gas supply; or by the introduction of an independent water supply; or by the purchase of the existing undertakings. It would be the duty of the Water Authority maturely to examine which of these schemes, separately or in combination, would be most advantageous to the public. In order to give effect to any of them, further statutory authority would be necessary, so that the judgment of Parliament on any scheme adopted by the Water Authority would be finally reserved.

Aug. 3, 1880.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

MONDAY, AUG. 2.

(*Before the* MASTER OF THE ROLLS.)

DAVIS *v.* THE ISLE OF THANET GAS COMPANY.

To-day a motion was made on behalf of the defendants, asking that the judgment pronounced by the Court on the 29th of June last be varied, and stand as follows:—"The Court doth order that the defendants, the Gas Company, be perpetually restrained from laying or continuing pipes under the public road running from Margate to Birchington, which traverses the plaintiff's property, and from allowing any pipes to remain therein." It will be remembered that the object of the action was to restrain the defendants from breaking up the soil of any of the streets within Westgate-on-Sea, or within the limits of any other land of the plaintiff, without his consent. The plaintiff, who is the owner of an estate at Westgate-on-Sea, and also the Birchington Gas-Works, alleged that the defendants broke up the soil of Street Hill, and commenced laying pipes along the road in the direction of Birchington, without his leave. The defendants insisted that they had a right to lay pipes along Street Hill, as they were authorized under their Act to supply places "adjacent" to Margate, Ramsgate, and Broadstairs, and contended that Birchington was an "adjacent" place within the meaning of the Act. The dispute in the action being whether Birchington was an "adjacent" place within the meaning of the Act, the Court decided it was not, and granted the injunction asked for.

The MASTER of the ROLLS now varied the order as asked, and intimated that the injunction granted was solely confined to the *locus in quo*—namely, where the pipes were pulled up.

CENTRAL CRIMINAL COURT, LONDON.—TUESDAY, AUG. 3.

(*Before Sir* THOMAS CHAMBERS, *M.P., Recorder.*)

THE EXTRAORDINARY CHARGE AGAINST THE DIRECTORS OF A GAS COMPANY.

At the opening of the Court this day,

The RECORDER, in concluding his charge to the Grand Jury, said: There is only one other case with which I need trouble you, and it is a very remarkable one. It is a charge against two gentlemen who occupy respectively the posts of Chairman and Deputy-Chairman of the Tottenham and Edmonton Gaslight and Coke Company. Upon the indictments before you they are charged, I suppose, as Directors of the Company, with misappropriating gas under the provisions of an Act of Parliament, which provides that whosoever, "being a director of any public company, shall fraudulently take or apply to his own use or benefit any of the property of the company, shall be guilty of a misdemeanour." Now, the circumstances of the case are these: One of the parties charged had been the whole life and soul of the Company; it being admitted by all parties that his services were absolutely incalculable, and that he had by his exertions, and by pledging his credit with coal merchants and others, raised the Company from the lowest state of depression to a state of great prosperity. I believe all parties agree that this could not have been done had it not been for the services of the Chairman of the Company. He seems to have resided in the neighbourhood of the Company's works, and to have followed the profession of a doctor; but he left this profession and devoted himself to managing the Gas Company, and gas was supplied to him without a meter during the years he has been the Chairman of the Company. No charge for this gas appears in the Company's books, because no record of the consumption was kept. Ultimately some question appears to have been raised about the matter, and hence the present charge. With regard to the Deputy-Chairman, he had a supply by meter, and upon going to live in the neighbourhood of the works, he spoke to the Company's collector, or the person who had charge of the meters, and said: "I am told that resident Directors have gas supplied to them gratis, but, nevertheless, I will have a meter;" and, accordingly, a meter was put up, which meter was examined every quarter regularly for

seventeen quarters, and the account was taken just the same as it would have been in the case of any other consumer. The Deputy-Chairman paid, like any other customer, for the coke and coal he bought of the Company, but it appears that as regards the gas which was burnt in his house, no charge was made, owing to the word "open" having been written upon the counterfoil of the meter register book, in consequence of the conversation I have referred to; the word "open" being a direction to the collector that it was not to be charged, and that the Deputy-Chairman, being a resident Director, was not expected to pay for his gas. Now, it appears that two gentlemen—the prosecutors—subsequently became Shareholders in the Company, and there is a suggestion that they earnestly desired to join the management—to become Chairman and Deputy-Chairman—and there seems to be some ground for this suggestion. These gentlemen happened to find out about the free supply of gas to which I have referred, and having complained of it at the next meeting of the Company, the Chairman gave an account of his connection with the Company. The Deputy-Chairman also explained the circumstances, saying that the register of the meter had been taken, and the accounts made up every quarter, and that he was ready to pay for the gas which had been consumed. The feeling of the Shareholders at the meeting was very strongly in favour of the Chairman and Deputy-Chairman, as they seemed to think no fraud had been intended; but that will be a question for you to decide. These gentlemen are charged, as Directors, under the section of the Act of Parliament which I have just read to you. The question will be, whether the acts of the defendants were not done, to use a mild phrase, under a misconception, and whether they were done without any fraudulent motive. The evidence is that the defendants were resident Directors of the Company, and took enormous trouble in the management of the concern, and for these services the supply of gas was not to be charged to them as to ordinary customers; but this will be a point for you to consider. As to stealing the gas, I cannot see that there will be any case at all, because the gas was laid on by the Company's servants. It is not like the case of a fraudulent removal of a meter. If a person has a meter, and the Company supposes that all the gas passes through it, and the person diverts the gas by using a curved pipe, so as not to allow the gas to go through the meter, then no doubt the person so acting is stealing gas; but here the gas was laid on and supplied by the Company, it was known to the authorities of the Company, and to the inspector. In one of the two cases it was passed through a meter just like the supply to any other customer; and in the other case no meter was fixed, because it was thought that, as the Chairman was not to pay for his gas, it would not be worth while to go to the expense of putting up a meter. I do not think there can be any charge of stealing gas; the only question can arise under the section of the Act of Parliament which I have read to you. If you are satisfied that, from the beginning to the end, there was no fraud intended by these gentlemen it is not right that they should be put upon their trial; and if you are of opinion that it is not a case which should be inquired into by a petty jury, you will say so. The meeting of Shareholders was satisfied with the explanation, and the bill in one case having long ago been paid, the matter is one which might very well have been allowed to end after the meeting; but if you are of opinion that it is not likely, under the circumstances, that any jury would find these gentlemen guilty of fraudulently misappropriating gas, you will not put them upon their trial.

WEDNESDAY, AUG. 4.

The Grand Jury this day returned "No true bill" in any of the counts of the indictment against either of the defendants.

Miscellaneous News.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Nineteenth Annual Meeting of this Association was held in the Academy Hall, Perth, on Thursday and Friday, the 8th and 9th of July, under the presidency of Mr. JAMES ROBB, of Haddington.

THURSDAY, JULY 8.

The PRESIDENT having taken the chair,

The SECRETARY (Mr. David Terrace) read the minutes of last year's meeting of the Association, held in Edinburgh, as well as of the several meetings of the General Committee during the year, and they were approved of.

ADMISSION OF NEW MEMBERS.

The following gentlemen were admitted members of the Association:—

ORDINARY MEMBERS.

Blyth, T.	Kettle.
Carmichael, J.	Kirriemuir.
Marshall, W.	Brechin.
Wilson, P.	Stonehouse.

EXTRA-ORDINARY MEMBERS.

Bray, G.	Leeds.
Briggs, W.	Arbroath.
Donald, D.	Johnstone.

ELECTION OF OFFICE-BEARERS FOR 1880-81.

Messrs. Alex. Donaldson (Edinburgh) and R. Hall (St. Andrews) were appointed Scrutineers to examine the ballot-papers, and they subsequently reported that the following gentlemen had been elected Office-bearers for the ensuing year:—

President—James M'Gilchrist, Dumbarton.

Vice-Presidents—William Mackenzie, Dunfermline; Thomas Whimster, Perth.

Secretary and Treasurer—David Terrace, Arbroath.

Committee—G. R. Hislop, Paisley; Alex. Mitchell, Dundee; Samuel Stewart, Greenock.

Auditor—D. Bruce Peebles, Edinburgh.

It was agreed that the place of meeting next year should be Glasgow.

PRESIDENT'S INAUGURAL ADDRESS.

The PRESIDENT then said: Gentlemen,—It has fallen to my lot at this time to be called upon to occupy the position of President of the North British Association of Gas Managers; and I cannot allow the opportunity to pass without thanking you for the honour conferred thereby, not on me only, but at the same time on those members of the Association who, like myself, manage the smaller class of gas-works in Scotland. I look upon myself as a representative man, and have no desire to monopolize the honour, but willingly share it with all those who feel like me.

In submitting to your consideration a few remarks, I shall endeavour to be very brief, as I consider it would be presumptuous in me to stand up as the instructor of a body of gentlemen such as I see before me, whose opportunities and means of gaining theoretical and practical knowledge connected with the manufacture and distribution of gas, have been immensely greater than my own. From my long experience as a Manager, I hope you will bear with me while I indicate a few points which may be of use to some of my younger brethren. To those of them who have just entered the profession, and taken upon themselves the duties of a manager, I would say: Do not be in a hurry to change your situation; rather settle yourselves down to work, and endeavour to gain that experience which time alone can give. You will thus gain a character which will render you a formidable competitor when a favourable opportunity arrives for improving your position. When the mind is continually on the alert, watching for an opening, it has a tendency to cause us to lose sight of the duties of our situation, and instead of serving our purpose, leads us in the end farther from the object of our desire. As I have said before, do not be given to change; strive to gain the confidence of your directors and consumers, and by-and-by, like myself, you may find it altogether unnecessary. Peace of mind is of more value than great riches.

Coming in the next place to speak of coal, you will find me very conservative on that subject, having many years ago fixed upon a standard for my own working, to which I have rigidly adhered, constantly using coal from the same collieries and from the same seams, and thus I am enabled to approximate closely to the quantities of each kind required to produce the quality of gas with which it is intended to supply our consumers. In this way you may arrive at an easy mode of conducting small gas-works, and have no necessity for constantly testing the numerous kinds of coal which are presented to your notice. Purification is also effected with greater certainty, and I have found it to be advantageous, on changing a purifier, to enter the date, the index of the meter, and the quantity of gas passed through.

In connection with coal, I would remind my younger brethren, to whom I am now addressing myself, that it is of the utmost importance to have a practical acquaintance with the various seams of parrot coal which are daily offered for our acceptance. The seams of parrot coal are not so numerous as the names by which they are called; for although the same seam is wrought by one man on one side of a fence, and by another man on the opposite side, yet these coals are presented to us under names "as wide as the poles asunder;" so that, without a practical knowledge of the appearance of the coal, and of the geological position of the strata in the district from which the coals are said to come, we are very apt to feel ourselves in the position of the man who buys "a pig in a poke."

To those members who have not the advantage of immediate proximity to a coal-field, there are many valuable and instructive works from which a vast amount of knowledge on those subjects may be obtained. I need only mention the valuable series of maps of the Geological Survey of Scotland, and the memoirs accompanying the same; also a valuable series of prize essays on the Geology of Scotland, published by the Highland and Agricultural Society, and embracing nearly all the counties of Scotland.

The retort-house claims a large amount of our attention, and in my opinion it is of the first importance, being the principal place where the money is earned. Without careful supervision over all the operations conducted therein, you will find that your difficulties will be neither few nor small. Good, honest, and steady workmen also are indispensable to the comfort of a manager in a country town, and when he is so fortunate as to obtain men of this description, he should be kind and considerate to them, and should not lightly part with them.

Outside the works, as you all know, the duties of a manager are highly onerous. The mains and services require great attention, especially on those lines of communication subject to the traffic of road locomotives, the wheels of which crush through the service-pipes, particularly in streets where there is only a main on one side. Escapes should be at once attended to, so that all risk to life or property may be avoided.

Meters claim a large share of our attention; and having had the inspection, watering, and keeping in working order of all our meters for a period of more than 30 years, and having done this work unassisted, I may claim your forbearance when I state that I ought to be able to speak confidently as to the following results of my experience with the various kinds of meters which have come under my observation. I have found that, on an average, such sized meters as are to be found in Haddington, ranging from 3 to 5 lights, require in a period extending from the 15th of May to the 15th of November, 12 cubic inches of water to adjust them properly, and from the 15th of November to the 15th of February, 13 cubic inches, and from the 15th of February to the 15th of May, 8 cubic inches, amounting in all to 33 cubic inches of water per meter per annum as the quantity requisite to supply a 3-light meter for a year. I have attained this result from carefully noting the number of gallons of water required during the course of each survey, and you may perhaps feel a little astonished when I tell you that I have in the course of these surveys distributed nearly 9 tons of water.

There may be some here who are anxious to know my opinion as to the merits of the various meters which have come under my observation; but I wish it to be distinctly understood that I purposely refrain from making a comparison between the meters of either one maker or another. The meters with which I have had to do are, in my opinion, wonderfully perfect instruments. All meters work well if properly attended to; but as well may we expect a steam-engine to do its work without being supplied at stated periods with water and fuel, as look for a gas-meter working correctly when it is not attended to at regular intervals, and no care taken to see that it is properly adjusted with water. My experience leads me to believe that it requires more skill and a better acquaintance with the internal mechanism of a gas-meter than is generally possessed by ordinary inspectors before we can expect the full advantages to be derived from the use of such correct and beautiful instruments of measurement.

Speaking as the Manager of small works, and as one having his own meters to inspect, I make no secret of the desire I feel to possess a good and reliable dry meter; and in this desire I am sure I shall be upheld, in the opinion of all those who know what it is to face an inspection of wet meters, with all its disagreeable concomitants. I am glad to see that some of the largest corporations and gas companies in Scotland are rapidly, and to a large extent, adopting dry meters in preference to wet ones; and the encouragement thus given to manufacturers will, I hope, stimulate them to improve and perfect the dry meter until it becomes the only meter on which all of us may with confidence rely.

In looking over our Transactions for several years past, I am astonished at the number of so-called inventions and improvements in gas manufacture, and machinery connected therewith, which have been offered for our acceptance, and been urged upon us with much eloquence and many weighty reasons, and yet you all know that few, if any, of them are ever heard of afterwards. Whether this arises from apathy to the interests of our profession, or from that intuitive faculty which it is said we Scotchmen possess in a remarkable degree—I will not say of "seeing through a millstone," but rather of seeing at a glance the real value of anything that is placed before us, I will leave some one else to determine.

There is one thing, however, which we cannot set aside, and that is the bold flight of our modern gas engineers in an upward direction. We have seen scrubbers towering above all other buildings in gas-works, and we shall shortly have an opportunity of beholding a gasholder, when filled with gas, rising to the amazing height of 160 feet. We may well ask—What next? Some one will say, "The electric light;" but, gentlemen, I think we are far from seeing the realization of the hopes of those persons who have embarked their fortunes in the production thereof. Yet we need not

shut our eyes to the fact that an intense and a brilliant light can be produced, which may be used to great advantage in some situations; and although I believe that the time is far distant when it will take the place of coal gas in domestic illumination, yet I am convinced that when the necessity arises for its adoption, Science will be able to overcome the difficulties with which the subject is now surrounded.

Within the past two or three years it has struck me forcibly that, as gas managers, we have been losing sight of the primary object of our profession—viz., the production of illuminating gas, and have been drifting away in the direction of becoming manufacturers of the secondary or residual products thereof. I am led to this conclusion from the prominence which is given to this subject at all the meetings of our Associations, and from the multiplicity of machinery which has of late years been patented for the purpose of enabling us to enter into the trade. Almost daily we have our attention called to some washer or scrubber newer and more efficient than any other which has preceded it, and if the benefits resulting from the use of these improved appliances are really as great as they are represented to be, I do not see how any one can reasonably delay their adoption. As ammonia is becoming such a valuable article of commerce, it may become a question with gas managers how far the amount of this substance contained in a coal should enter into their calculations when making a contract for their yearly supply. The quantity of ammoniacal liquor, and its strength, have not hitherto formed items in the results obtained from a ton of coal in the analyses sent to us (with the exception of a very few); but I expect it will take a more prominent place in all future analyses. My only fear is that coal merchants will not be slow to take advantage of the additional value conferred on the article in which they deal, and add to the price of the coal according to the quantity of ammonia contained therein. As showing the difference in the quantity of ammoniacal liquor contained in a ton of coal, the following is a sample:—

Muirkirk	14·00 gallons
Stanrig	3·90 „
Foulshiels	24·15 „
Shotts	9·06 „
Ponfiegh	31·00 „

Allow me to apologize, gentlemen, for trespassing so much on your time and patience. It only now remains for me to call your attention to the very interesting list of papers and communications, the titles of which you will find in the programme.

On the motion of Mr. D. Bruce Peebles (Edinburgh), a vote of thanks was passed to the President for his address.

Auditor's Report.

Mr. Peebles then read his report on the state of the finances of the Association; and this being considered satisfactory, was adopted.

The reading of papers and communications afterwards commenced, and these were taken in the order appointed by the Committee.

Mr. J. Anderson (Leven) read the following paper on

MECHANICAL SCRUBBERS.

When your Secretary asked me to write a paper for this meeting, I began to consider what subject connected with the manufacture of gas could one, who had for several years laid aside the responsibilities of a gas manager, hope to make interesting and profitable to gentlemen, like yourselves, actively engaged in that manufacture, and whose professional opportunities for observation were certainly far more abundant than his own. The only subject I could think of was that of "Scrubbers," and, more especially, "Mechanical Scrubbers," with the introduction and construction of which I have had a good deal of experience lately. This paper cannot pretend to be an exhaustive treatment of the question, and should rather have been styled "A few rough notes concerning such mechanical scrubbers as have come under my own observation," and in giving you these rough notes I do not wish to be considered as puffing up one scrubber more than another, but as merely endeavouring to explain to you, as clearly as possible, their construction and principles of action.

In the early days of gas manufacture, when managers troubles were fewer, or at least less complicated—directors, shareholders, and consumers less exacting—the working plant of a gas-works was very simple indeed. Retorts, condenser, and purifier comprised the whole. When, however, the destructive effects of ammonia and other impurities in gas which escaped the action of the lime purifier began to show themselves on a growing scale corresponding to increased consumption, steps had to be taken to remedy these evils. This led to the introduction of the washer, and (when this proved unmanageable on a large scale, on account of the great back pressure, and other difficulties) of the vertical scrubber filled with coke, bricks, wooden boards, tiles, furze, and other substances presenting a number of rugged surfaces, which were kept wetted by a copious supply of water run in at the top, and distributed by various contrivances more or less ingenious. The gas entering at bottom was supposed to be divided into as small and numerous streams as possible, and to come intimately in contact with the water, which, by its superior affinity, robbed it of its ammonia, and it passed out at the top in a pure state as far as ammonia was concerned; the water being drawn off at bottom in the form of weak ammoniacal liquor. As long as a large quantity of water was employed, this gave a gas free from ammonia, but, as I need hardly observe, a liquor of little commercial value. The great demand for sulphate of ammonia, however, induced the strengthening of the liquor by re-pumping, and passing it over and over again through the scrubber, until a saleable strength was obtained. This, however, caused the gas, at its issue from the scrubber, to come in contact with the foul liquor, and to carry away with it traces at least of ammonia, and often a good deal more. This re-pumping had also the effect of fouling the scrubbing material, and, as many of you know to your cost, the changing of the material became a very dirty process, and could only be done by throwing the scrubber out of action, and therefore only in the summer time, however foul it might become in the course of the winter's work. The re-pumping, too, having in small works to be done by hand, was a laborious business. These defects have led to the heightening of the column of scrubbing material—to the erection of those veritable "towers" which overshadow so many of our large gas-works. These are no doubt effective, as the height is so great that pure water entering at top becomes converted into liquor of 6° to 8° strength on issuing at the bottom, and the gas issuing at top is practically free from ammonia; but there is, of course, the pumping of the water in most localities to their great height, and what must come in time, the removal and renewal of the coke or other scrubbing material. These drawbacks have led engineers to devise some means whereby the scrubbing material could be constantly washed clean from ammonia, and immediately presented freshly wetted to the gas, divided into very minute streams—could, in fact, be constantly revivified, and could also, while yielding strong liquor, be so constructed that a small stream of pure water only comes in contact with the issuing stream of pure gas—pure, at least, as far as ammonia is concerned.

One of the earliest of these machines, though not primarily intended as a mechanical scrubber, was the rotary exhauster of Mr. Whimster—a member of your Association—in whose works here one may be seen still doing good work, though becoming unable to cope with the greatly increased make of gas since it was erected. This consists of a cylindrical vessel filled to about two-thirds of its diameter with water, in which works a scoop drum with vanes or scoops arranged in radial curves. The case is divided by two dip partitions into three compartments. The centre compartment contains the scoop drum, and is in communication with the condenser and hydraulic main, the two end compartments communicate with the outlet to the purifiers. The drum being caused to revolve by suitable gearing, the gas is drawn or scooped into the inside of the drum, carried down to its centre, where it finds its exit by bubbling up through the water into the two end compartments. This is more truly a mechanical washer than a scrubber, but it has this in common with the mechanical scrubber, that it presents the freshly-wetted surfaces of the radial passages to the contact of the gas divided into moderately small streams. Perhaps Mr. Whimster may be able to give us a few details in regard to his machine, which, no doubt, will be interesting to us all.

Another mechanical scrubber was also invented by a member of your Association—Mr. John Reid, of Leith; and as he has kindly sent me a description of it, I will take the opportunity of bringing it before you, though I dare say many of you have had an opportunity of seeing it in action at the gas-works at Leith, where it was introduced in 1865, and is still in full action. This apparatus consists of a close cast-iron cistern, divided into two equal chambers by a longitudinal vertical partition, in each of which chambers revolves a hollow cylinder, the periphery of which is composed of cast-iron buckets in the manner of a water-wheel, except that the outside of the buckets is enclosed, and the inside perforated with a great number of holes ¼-inch diameter. The cistern is filled with water to 2 or 3 inches above its centre line, and the cylinders, which are supported on strong axles, caused to revolve. The gas enters into the centre of the first cylinder, passes through it under a dense shower of finely-divided spray, and on reaching the end is carried by a cross passage into the centre of the second cylinder, where it receives similar treatment, and is delivered at the front of the machine perfectly free from ammonia. This has been taken up by the water, which is gradually brought up to any required strength—say 10°. The machine requires very little power to drive it, and is most effective; but the gas is not subdivided thoroughly, as in some others of later date, and with the quantities required to be dealt with in our large works the machine would either require to be made very long, or the risk run of the gas passing through in large bulk without coming into contact with the water.

Another of the early mechanical scrubbers was one invented by Mr. Still, of the Chartered Gas Company, London. It consisted of a long cylinder laid on its side, and having a shaft passing through it horizontally, furnished with pans. The cylinder being partly filled with water and the pans caused to revolve, a cloud of spray was raised, through which the gas passed from one end of the cylinder to the other. This machine, besides requiring great power to drive it, did not divide the gas into small streams, and thus lost much of its useful effect.

The next machine which I wish to bring before your notice is Anderson's Brush Scrubber, invented some five or six years ago by Mr. George Anderson, of London. In this machine the gas, where there is any doubt of its being imperfectly condensed, is first passed through a washer, made on his well-known principle with serrated ledges, so that any light tar or oil which may remain in the gas is arrested, and also a considerable amount of ammonia. It next passes into the first chamber, in which revolves a cylinder covered with Piassava fibre—a substance which is practically indestructible, and is secured to the cylinder in a mode that renders its getting loose almost impossible. The gas then ascends into the next chamber, and so on until it issues from the last chamber perfectly free from ammonia. During its progress it has also parted with a large quantity of carbonic acid and sulphuretted hydrogen, and thus the lime purifiers are relieved of a considerable amount of work, in many cases saving from 30 to 40 per cent. of the lime usually required per ton of coals carbonized. The brushes being caused to revolve at from two to four revolutions per minute in a direction opposite to that of the ascending gas, thoroughly break up the gas, and bring it intimately in contact with the liquor. The brushes being half immersed in the liquor, carry a large quantity with them, and present clean and freshly-wetted surfaces to the gas at each revolution. These machines are very easily driven, as all the parts are balanced, and there is only the friction of the brushes passing through the water to be overcome. Pure water above, at the rate of 10 gallons per ton of coals carbonized, is run in at the top, and as this is all that comes into contact with the gas, the illuminating power suffers little if any deterioration. The dread of lowering the illuminating power of your rich cannel gas by contact with water is, I know, very prevalent amongst managers of Scotch gas-works, and has, no doubt, stood much in the way of the introduction of scrubbers. There may be some foundation for it when large and copious streams of water are used, but the small quantities introduced into these scrubbers can, I think, have no prejudicial effect whatever. In regard to this, however, I would be glad if any one of your number who has had practical experience of the working of these scrubbers would give us the results of his observations, as, though I had a small one at work all last winter in our own small gas-works, I have had no facilities for photometrical observation.

The next machine, and, I believe, the most recently invented one, is the "Standard" Washer and Scrubber, invented and brought out by Messrs. Kirkham, Hulett, and Chandler, of London. This consists of a cast-iron case divided into compartments, each compartment communicating with the next by a hole in the centre of the division-plate. A horizontal shaft passes from end to end of the case at its centre, and has strung in it a number of discs, one for each compartment. These discs are composed of a cast-iron centre portion, one side open like the arms of a wheel, and the other fitting closely to the shaft, and allowing no gas to pass. To each side of this is rivetted a wrought-iron circular plate, extending to within a short distance of the outer case. The space between these two plates is filled in with a great number (from 60 to 120 layers according to size) of very thin (No. 27 B. W. G.) sheet iron. These sheets are covered all over with dimples 3-32nd-inch high, so arranged as not only to act as distance pieces, to keep the sheets apart, but also to break up the gas not only into thin layers, but again into innumerable thin streams. The case is filled with water to a certain height, but 1 inch lower in each compartment, thus providing that the flow of the liquor will always be in an opposite direction to that of the gas. About 10 gallons per ton of coal carbonized is run in at the high end, and gradually overflows into the other compartments, becoming in its course changed to ammoniacal liquor of 6° to 7° strength, according to the character of the coals carbonized. The gas from the condenser being admitted at the low end, as I may term it, though the case is really level, passes first into an empty chamber, then through the centre of the division-plate into the centre of the first disc; being unable to pass through this, it must find its way out to the periphery of the disc through the vacant spaces between the dimpled sheets. The shaft carrying the discs has a slow motion, about four revolutions per minute, imparted to it from any suitable motor, and thus constantly presents clean and freshly-wetted surfaces to contact with the gas. After passing through one disc, it enters the next chamber at the centre of the next disc, and so on until it emerges from the last

disc perfectly free from ammonia, and having, as in Anderson's scrubber, parted with a large amount of carbonic acid, and also sulphuretted hydrogen. Little or no resistance is presented to the passage of the gas, and the power required for working the scrubber is very little, as the discs are completely balanced, and there only remains their friction through the water to be overcome.

And now many of you will be ready to ask, What is the benefit of using these really simple, though perhaps some of you may think complicated and too delicate machines for use in gas-works?

1. A gas perfectly free from ammonia. In regard to this great advantage I need say little, as you are all in a position to appreciate this better than I can explain it. The increased durability of your meters and other fittings will alone repay you, and the freedom from complaints from customers of stopped fittings will also be found a great relief. In all the experiments mentioned on the tables I have here, you will see that no ammonia escapes the action of these scrubbers.

2. A great saving in lime and consequently labour (the lime not requiring to be so often renewed) in the lime purifiers. And I may notice under this head increased comfort to the men, as they no longer have the carbonic acid to contend with when changing the purifiers, which has often produced dangerous results well known to you all.

3. An increase of the quantity of ammoniacal liquor for sale, at the rate of 10 gallons per ton of coal carbonized, and, as you will see from the accompanying tables, of from 6° to 10° strength, depending on the character of the coals carbonized. Table No. 1 gives the result of experiments made in Waterford with a scrubber passing about 250,000 cubic feet in 24 hours. And in all except the last test, when the water was purposely shut off, the gas issuing from the outlet was perfectly free from ammonia. Table No. 2 is a test in ordinary working at the gas-works, Vauxhall, London, from a scrubber passing 800,000 cubic feet per day, and giving perfectly pure gas, as tested by a constant litmus test. Table No. 3 is a similar table showing the result of the working of one of Messrs. Kirkham, Hulett, and Chandler's "Standard" scrubbers passing 60,000 cubic feet per hour, and yielding gas perfectly free from ammonia, and 10 gallons of liquor of 11 to 13 oz. strength per ton of coal. Table No. 4 also shows the same result, with at the same time an analysis of the gas, showing that in its passage through the scrubber it has not only parted with all its ammonia, but also with one-fourth of its sulphuretted hydrogen and carbonic acid.

TABLE No. 1.

Gas-Works, Waterford.

Place of Test.	Gallons of Water run in per Ton of Coal.			
	Twelve Gallons. Strength.	Eleven Gallons. Strength.	Ten Gallons. Strength.	Water stopped to Increase Strength.
	Ounces.	Ounces.	Ounces.	Ounces.
Bottom box	13 8/10	16	18	19 4/10
First brush	11 8/10	14	15 2/10	17 6/10
Second brush	4 6/10	5 4/10	7 4/10	13 4/10
Third brush	1 1/10	2 2/10	3	6 6/10
Fourth brush	0 3/10	0 4/10	0 5/10	2 1/10
Fifth brush	—	—	0 1/10	Not tested.

TABLE No. 2.

	Ounces.
Bottom box	9
First brush	8
Second brush	3
Third brush	Trace.
Fourth and fifth brushes	—

TABLE No. 3.

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water Used per Ton of Coals	Gas Purified per Hour.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.				Inlet.	Outlet.	Atmosphere.	Inlet.	Outlet.	
	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces.	Galls.	Cub. Ft.					In.	In.	
Jan. 7.	11	9	7	5½	3½	3	1⅝	1½	½	—	10	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8.	9½	7½	6	4½	3	2	1	½	⅛	—	10	78,000	„	73°	61°	31°	28	26½	4½
„ 9.	11	9	7	5	3½	2½	1½	1	⅛	—	10	82,000	„	74°	67°	33°	27½	25½	5
„ 10.	10½	8½	6½	5	3½	2½	1½	1	⅛	—	10	66,000	„	76°	64°	28°	28½	27	5
„ 11.	12½	10	7½	5½	4½	3½	1½	1½	⅛	—	10	61,000	„	73°	64°	27°	26½	25½	5
„ 12.	11	8½	6½	—	—	—	1½	⅛	⅛	—	10	39,000	„	74°	64°	27°	26½	25½	5
„ 13.	13	10½	4½	6	4½	3½	2	1½	⅛	—	10	78,000	„	73°	65°	42°	28	26	5

TABLE No. 4.

Gas passing per Hour.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	Nos. of Divisions and Strength of Liquor.										Water Used during Experiment.
		SH_2.	CO_2.	NH_3.	Washer.	Air.				10.	9.	8.	7.	6.	5.	4.	3.	2.	1.	
Cub. Feet.				Grains.																Galls.
64,000	Inlet.	2·00	2·00	158·8	72	57	21	47	Twad. deg., at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	65
	Outlet.	1·50	1·50	0·8	68	57	20		Acid, ounces	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

These are valuable results, not only in a chemical but in a commercial point of view. I have been in correspondence with manufacturers of sulphate of ammonia, and have obtained from them very conflicting estimates of the value of ammoniacal liquor of different degrees of strength. One maker writes, that assuming the liquor to be of the degrees of strength indicated below, the prices realized would be as follows:—

Liquor of 3° strength,	=	2s. 0d.	per 100 gallons	at gas-works.
„ 4° „	=	3s. 4d.	„ „	„
„ 5° „	=	4s. 8d.	„ „	„
„ 6° „	=	6s. 0d.	„ „	„
„ 7° „	=	7s. 4d.	„ „	„
„ 8° „	=	8s. 8d.	„ „	„
„ 9° „	=	10s. 0d.	„ „	„
„ 10° „	=	11s. 4d.	„ „	„
„ 11° „	=	12s. 8d.	„ „	„

From the above table it will be apparent that at 3° the liquor is worth 8d. per degree, and at 6° it is worth 1s. per degree per 100 gallons. Gas-works carbonizing 4000 tons of coal per annum without scrubbers will make about 80,000 gallons of liquor of 4° strength, worth £133 6s. 8d.; but by adding a mechanical scrubber, an additional 40,000 gallons of liquor of 8° strength will be made, which being added to the 80,000 will make 120,000 gallons of 5½°, worth £320, or a gain of nearly £190. This is, I think, a high estimate, but the actual prices paid in London last year per butt of 108 gallons of ammoniacal liquor were—

For 5-oz. liquor, of about	2½°	Twaddel	. . . . .	4s. 6d.
„ 6-oz. „ „	3°	„	. . . . .	5s. 5d.
„ 7-oz. „ „	3½°	„	. . . . .	6s. 4d.
„ 8-oz. „ „	4°	„	. . . . .	7s. 3d.
„ 9-oz. „ „	4½°	„	. . . . .	8s. 2d.
„ 10-oz. „ „	5°	„	. . . . .	9s. 1d.

or at the rate of about 1s. 10d. per degree, and you can easily understand that where the carriage of the liquor to makers works comes into operation, the value of the higher degrees increases rapidly.

From the foregoing figures you will see the value that ammoniacal liquor has attained of late years, and also the absolute waste that takes place when the ammonia is allowed to go forward with the gas to the dry lime purifiers, or, worse still, to the consumers houses. And I hope these remarks may be the means of directing the attention of such of you as have not already gone into the question, to the importance in gas-works of scrubbers, and where facilities exist, of mechanical scrubbers.

Discussion.

Mr. WATSON (Stirling) said he had had a little experience with Mann and Walker's scrubber, having worked one for about three years. The result had been a great saving to his Company in the way of lime for purifying; last year their lime account did not amount to ½d. per 1000 feet of gas made. He had had his ammoniacal liquor up to 15°, and had not found the illuminating power of the gas was affected by the washing necessary to accomplish this.

Mr. A. MACPHERSON (Kirkcaldy) said he could most emphatically bear out all Mr. Anderson had said regarding the importance of good scrubbers. He had one of Anderson's Brush Scrubbers erected at his works two years ago; and after two winters experience he could say it was a most efficient apparatus, and had been the means of very materially reducing the purification account. Mr. Anderson said he had reports from some sources of a saving of 30 to 40 per cent. of lime. In his (Mr. MacPherson's) case he calculated it had been a saving of from 25 to 30 per cent., and, like Mr. Watson, he found his purification at present to cost something like ½d. per 1000 feet of gas made. The saving in lime more than paid the interest on the capital expended on the scrubber, and the extra price received for the improved quality of the liquor had already repaid even the capital expended. He introduced the pure water at the top brush at the rate of 10 gallons per ton of coal carbonized, and at the overflow from the washer he obtained a liquor which averaged 10° Twaddel, and by merely reducing or increasing the water supply he could get the liquor of any required strength. He had found that, when passing about 270,000 feet of gas per day, the ammonia was almost entirely removed at the outlet of the third brush, leaving two brushes in reserve in case of any accident. He had never found the illuminating power of the gas to suffer in the least from the use of the scrubber. This might be attributed to the fact that the gas was introduced into the bottom box among the strong liquor, and was gently passed from brush to brush, always meeting weaker liquor as it ascended, and only in the last brush would it meet pure water, which was supposed to have an injurious effect on the illuminating constituents of gas. One of the objections raised by some persons to this scrubber was the power required to drive it. He found, moving as it did at such a slow rate of speed—two to three revolutions only per minute—that the power required was practically *nil*. Another objection raised to it was that the tar might get in and clog up the brushes. He had not found this to be so. He found that the washer attached to the bottom of the scrubber arrested any tar that might pass the condenser. But even supposing tar were to pass into the brushes, he thought by the introduction of some naphtha into the top brush, and allowing it to flow from brush to brush, it would entirely remove any tar from the brushes. In conclusion, he strongly advised the introduction of some kind of scrubber into all works.

Mr. PEEBLES said he had the usual feeling of Scotchmen in thinking that everything good came from their country. As regarded Anderson's scrubber, he thought he might safely claim it as the invention of a Scotchman, and so far as the efficiency of its work was concerned, this had been well testified to by Mr. MacPherson. When he (Mr. Peebles) first saw the scrubber of Messrs. Kirkham, Hulett, and Chandler, he rather thought there was a bit of Scotch blood in that too. As he was familiar with Mr. Reid's scrubber or washer—having been present at the Scottish Society of Arts when Mr. Reid read a paper on it—he thought he saw the embryo of the "Standard" washer and scrubber in Mr. Reid's invention. When in London, however, a few weeks previously, he mentioned the circumstance to Mr. Kirkham; and that gentleman told him he had never heard of Mr. Reid's scrubber at all. So it must be acknowledged to be an English scrubber. The construction of the scrubber was very simple; it was quite accessible, was easily managed, and must require very little power to drive it. The height of Anderson's scrubber might be against it;

but the other, lying as it did on the ground, must commend itself to the members of the Association as being an admirable invention.

Mr. J. M'Gilchrist (Dumbarton) thought the two scrubbers equally good—they were first-class. If there was any disadvantage in the height of Anderson's, it had the advantage of not demanding such large space for a foundation, and in gas-works—especially in old works—this was of great importance, because, as a rule, there was not much space to spare. Many of the engineers who designed gas-works, even so lately as 30 years ago, never dreamt of leaving sufficient space for scrubbers. He thought the reader of the paper, when he took up this subject, might have gone a little more fully into it. There was still another scrubber which had been recently patented and introduced, and was doing good work in two gas-works in Scotland—namely, the scrubber invented by Mr. W. Young. It possessed a special advantage for small works, where power was not employed, which large scrubbers did not have. It resembled Mr. Anderson's scrubber in height, but in Anderson's there must be a certain flow of water proportional to the make of gas, and this required supervision. In Young's scrubber the chambers were all of sufficient size to retain, say, the quantity of water necessary for a day's manufacture, so that the manager could at any suitable time of the day, or at night, fill the top chamber, and at any time during the next day test to see if the liquor was of the strength required. If so, he could allow the scrubber to flow over, and all he had to do was to empty the under chamber, and by turning the water on to the top chamber it automatically re-charged itself. So it went on from day to day, and thus the manager had no trouble in regulating the quantity of water to the make per ton. Mr. Young's scrubber had been added to the Lanark and the Falkirk Gas-Works, and in both places had proved very successful. They produced as nearly as possible 10 gallons of liquor per ton of coal, and that without any attention or mechanical appliance whatever. There should also have been mentioned the double scrubber which Mr. Brodie, of Paisley, erected at Dumbarton. It was an oblong cistern 21 feet in height, 9 by 4½ feet wide, divided by a cast-iron partition, with six trays in each division. This scrubber was filled with old brooms which had been used by scavengers, new ones not being quite so suitable. In connection with it there were two pumps. It had a large amount of surface, perhaps more than some of the new scrubbers, and altogether it was a thing he could recommend, because of its simplicity, efficiency, and cheapness. The difference between the scrubbers shown and this one was that the mechanical power was used in the one case to actuate the scrubbing machinery, and in the other to raise the water.

Mr. W. Mackenzie (Dunfermline) asked Mr. Anderson how much back pressure would be thrown upon the retorts, supposing there was a sudden stoppage of the mechanical arrangement in the brush scrubber.

Mr. Anderson: Not more than half an inch.

Mr. MacPherson: Suppose the duration of the stoppage to be ten minutes, the back pressure would be hardly anything.

Mr. A. Mitchell (Dundee) said at their works, some three years ago, two of Mann and Walker's scrubbers were erected, at a cost, he thought, of about £2000. They had been working eight months before the end of their financial year, and they then found the increased make of sulphate of ammonia warranted them in coming to the conclusion that in six years the scrubbers would pay for themselves, interest and capital. No doubt the same thing could be said of Anderson's and the other scrubbers named. In some cases it might be that ammonia could be detected after the gas left the scrubbers, but with Mann and Walker's scrubber there was not any ammonia at all detected. They seldom tested for it, and if they did it was only, perhaps, to allow a stranger to see that really no ammonia could get past the scrubbers in ordinary working. He thought a great deal of the efficiency of scrubbers lay in the amount of space set apart for the gas to settle in, so to speak. It took about seven minutes for the gas to pass through their scrubbers. A great deal, too, lay in the gas being held in intimate connection with the wetted material to dissolve the ammonia. He should have thought that in the event of the machinery stopping there would have been a larger amount of back pressure than had been stated, seeing how the water stood above the divisions of the brush scrubber.

Mr. T. Whimster (Perth) said he had formed a very high opinion of Anderson's scrubber. It must be efficient, because there were no means by which gas could pass without coming into intimate connection with the water, and without being pressed upon a wetted surface. With regard to tower scrubbers, he might say that, in his earlier days of gas experience, he had a good deal to do with scrubbers filled with brooms, whins, and all sorts of things—sometimes coke, sometimes tiles and broken material—and it was found to be fearful work cleaning them out annually. The smell was so offensive that it had perhaps prejudiced him very much against them. As had been mentioned, he had an apparatus that did a certain amount of work in scrubbing and washing, but to secure that no ammonia should pass on to the purifiers he erected about ten years ago a washer of very simple construction. It was a simple cylindrical vessel, 15 or 18 feet high, constructed with plates, each about 4 feet in height. The top plate was dome-shaped, and the other plates or shelves were flat. They were made of cast iron, with ¾-inch holes punched in them as thick as they could be placed. There was besides a 3-inch pipe falling right on the top of the dome. Fresh water was pumped to the top, and as it fell on the plates it met the gas coming up. The water splashed on the first, second, and third plates, so that there was a perfect shower, and any part of the gas passing up through the holes was immediately brought into contact with a wetted surface, and thus practically no ammonia was left in the gas after it passed through the machine. This was a simple and a cheap washer, and although he could not put it into competition with Anderson's, yet there must be a material difference in the cost.

Mr. W. Briggs (Arbroath) said that in all the gas-works with which he had business he strongly recommended the erection of scrubbers. The great difficulties which stood in the way were the first cost and the mechanical power required to work them. As was well known, a large number of gas-works carbonizing a small quantity of coal had no mechanical power at hand, and he therefore strongly recommended managers of such works to give special attention to Mr. Young's scrubber, which required no mechanical power.

Mr. Mitchell said that the Mann and Walker's scrubber they had had been in active work for three years, and they had had no experience of the flowing out of tar. There was as yet no difference between the outlet and the inlet of the scrubber, and so they had not had experience as to how much time it would take to clog them up. He did not think any small gas-works should have any difficulty in introducing a scrubber on account of the want of power, because gas-engines could now be plentifully had from one-man power upwards.

Mr. W. Young (Clippens) said there were a number of features essential to a scrubber, particularly for small works, where mechanical power could not be conveniently obtained; and even in large works where motive power could be conveniently used, there were certain drawbacks to any form of machinery, where the scrubber was required to be constantly in motion to keep it in full operation. Should the mechanical scrubbers so fully described in the paper stop for any period of time, they immediately fell out of action, whereas a scrubber properly constructed should continue in action for such a time as might reasonably enable any defect in or damage to the machinery to be rectified, and the whole set right before the scrubber should be entirely out of action. The arrangement which he proposed to describe in his paper was a very simple one, and embodying most of the essential features of a scrubber for small works. At the same time it was applicable either to large or small works, but was eminently suited to the wants of the latter. It held a supply of liquor sufficient for some days; it totally abstracted the ammonia by the water once passing through it, requiring no pumping; it was self-regulating; it supplied its own water; it drew off its own liquor when it attained the proper strength; and further than this its moving parts were very simple, not liable to get out of order, and were actuated by the gas itself.

The President said he was sure the members were all indebted to Mr. Anderson for his interesting observations. The subject was a very important one in these days, when so much attention was being directed to the bye-products of the manufacture of gas. He would point out, however, the curious similarity between Anderson's scrubber and one which existed some 33 years ago at the works with which he was connected. It was exactly in the form of a wheel, but it had only one row of plates. The wheel was filled with scavengers brooms. This scrubber was put up by the engineer who originally planned the works—Mr. Mark Taylor. At one time Mr. Taylor was in the Edinburgh Gas-Works, and 40 or 42 years ago he was appointed to Kelso. He put up at Haddington a scrubber which was about 4 feet 6 inches in diameter, and was filled with old brackens, and round about it was done with wicker work. A cistern about 4 feet in diameter was placed in another house, which kept on working for about a week or a fortnight at a time. He (the President), however, did away with it when he was remodelling the works, as it was unequal to the quantity of gas which he was making.

Mr. Anderson, in reply, said he was sorry that he did not bring out all the points in respect to scrubbers, but he said at the outset that the subject of scrubbers was a wide one, and that he would merely be able to give the results of his own observations. Supposing the scrubbers were suddenly to stop, a little ordinary skill could supply a water-tank at a higher level, and this would keep up a constant flow of water. Then as to power, one or two men could make the machine turn occasionally, so as to keep the brushes sufficiently wet.

Lecture by Dr. Miller, of Perth.

Dr. Miller, of the Perth Academy, at this stage of the proceedings, delivered a lecture upon "Heat: Its Mechanical Energy," for which a vote of thanks was accorded him.

An adjournment was then made for luncheon, and this afforded many of the members an opportunity of visiting (by the invitation of Mr. Whimster) the Perth Gas-Works, where, amongst other things, they saw the process of jointing pipes with Spence's Metallic Compound; a small size of Anderson's Brush Scrubber propelled by a steam-engine which also worked an exhauster; and a two-man power Bisschop gas-engine.

(*To be continued.*)

BIRMINGHAM CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Birmingham Town Council on Tuesday last—the Mayor (Alderman R. Chamberlain) in the chair, reports were presented from the Gas and Water Committees.

The Gas Committee's report opened with a resolution accepting the resignation of the Right Hon. Joseph Chamberlain, M.P., as Chairman of the Committee, and a statement that Mr. Marris had been appointed in his stead. It then referred to the proposed erection of new offices for the gas department, increased accommodation being urgently needed for the staff and the consumers, and stated that the Gas Committee had agreed to certain proposals of the General Purposes Committee for carrying out this work. In reference to the relations of the Corporation with the out-townships, in connection with the gas supply, the report stated that the Gas Committee having failed to negotiate terms for the transfer to the Oldbury and Tipton Boards of the portions of the Corporation's gas undertaking within their districts, it was determined to proceed to arbitration. The purchase-money (£70,750) for the West Bromwich portion of the undertaking had, it was stated, been paid on the 1st of July, when the conveyance of the works to the West Bromwich Commissioners was executed. In reference to the general operations of the Committee, the report stated that contracts had been made for the construction of gasholder-tanks, £62,139; new retort-house, £18,888; exhausters, £550; engines, £425; new cottages for Canal Company, £498; station-meters at Swan Village, £810; roof, £500. Under the new contracts for tar it had become necessary to provide additional storeage at the Saltley, Windsor Street, and Adderley Street works. The Committee had therefore authorized the expenditure of £1796 for this purpose at Windsor Street and Saltley. An action to recover penalties amounting to £800 having been brought against the Corporation by Edward Hipkins, brother of the plaintiff in the late action of *Hipkins v. Birmingham Corporation*, they had settled the claim by payment of £200. The Committee had made contracts for the purchase of 315,000 tons of coal for the year 1880-81, at about the same rate as last year. These contracts had been made on more favourable terms than were anticipated; and the Committee, being anxious to take the earliest opportunity of making a reduction in the price of gas, were preparing calculations which would, they trusted, show that such a reduction might be safely made from the 1st of January next. The sale of gas for the half year ended June 30 was 1,388,741,200 cubic feet, as against 1,338,050,300 cubic feet in the corresponding period of the previous year, being an increase of 50,690,900 cubic feet, or at the rate of 3¾ per cent. During the half year 70 official tests of the illuminating power of the gas had been made, the highest being 17·87, lowest 16·89, and average 17·19 candles, being about 2¼ candles in excess of the parliamentary standard. The number of new services laid during the half year was 511, as against 450 in the corresponding period last year. The number of gas-fires supplied was 80; cooking-stoves on hire, 51; cooking and heating stoves sold, 129. The whole of the yards had been left clear of coke during the present summer. The stock in hand at the corresponding period last year was 19,000 tons.

On the motion of Mr. Marris, seconded by Mr. J. E. Baker, the report was adopted.

The Water Committee's report recommended the carrying out of certain works referred to in the report made to them by the Engineer (Mr. J. W. Gray), at a total estimated cost of £4300. The report also stated that in addition to the two sums of £5000 each, placed to the credit of the reserve-fund account in the years 1877-78, and £7000 in 1879, the Committee had transferred a further sum of £11,000 to the credit of the same account, making, with the accumulations of interest, a total of £29,799 13s. 3d. available for contingencies or for depreciation in the plant and machinery of the water department; in addition to which there was a surplus of £5416 1s. 4d. unappropriated.

In moving the adoption of the report, Alderman Avery referred to the subject of the revision of the water-rates charged by the Corporation. The Water Committee had, he said, been engaged upon this matter for

some time, and they proposed to submit to the Council returns of the water used by every class of house, of the various water-rentals throughout the town, the value, the number of persons, the trade purposes, and other information of a like nature, so that it might be seen how far the various charges made were equitable and just; and the Council having the facts before them, would then be in a position to properly consider the subject. He was very happy to invite the attention of the Council to the financial statement contained in the report, from which it appeared that the surplus for the half year ended June 30 last was nearly £5500, and the reserve-fund was £29,799, making together a sum of £35,000. The total amount of the reserve-fund the Council were entitled to accumulate was £50,000. It would, he said, hereafter be for the Council to ascertain whether they had any surplus in this department, and whether that surplus should be applied as a contribution to the general rates or in diminution of the water-rates. All needful works for the improvement of the water supply were being carefully carried out.

Mr. Cook seconded the motion, and suggested that when the surplus came to be disposed of it should, in fairness, be applied to the reduction of the water-rates to the consumers.

The Mayor said he must protest against the proposition that the whole of the surplus should be so applied. When the time came he hoped the Council would determine upon some appropriation which should take two directions—a contribution to the rates and a reduction of the charges to the consumers.

Mr. T. Martineau said he should be sorry if the Council should decide upon any appropriation of the water revenues until the Committee had accumulated the full reserve-fund of £50,000, which was a comparatively small sum when they considered that the total property of the department was valued at £1,721,463. What they ought to do with reference to the revenue of the department, in the first place, was to take all the steps they possibly could to purify the water supply, and when they had done this they should apply any surplus, not in the reduction of the rates generally, but in the reduction of charges to the consumers. He trusted that when the Council came to deal with this question they would consider first the claims of the owners and occupiers of small houses.

Alderman Baker said some members of the Water Committee strongly sympathized with the opinion expressed by Mr. Cook, but at present he (Alderman Baker) thought it was better to have a rectification of the water-rates rather than a reduction in price. There was no doubt that, in the manner in which the rates were now levied, some people were unjustly affected.

Alderman Avery, in reply, said before any reduction in the water-rates was decided upon, ample provision would be made for giving to the borough an abundant supply of pure wholesome water.

The report was approved, and the Council passed to other business.

TAUNTON GAS COMPANY.

The Thirty-fifth Annual Meeting of this Company was held on Tuesday, the 27th ult.—Mr. W. P. Pinchard in the chair.

The Secretary and Manager (Mr. A. J. Edwards) having read the notice convening the meeting, the report of the Directors, and the accounts of the year's working, were presented.

[The report stated that the quantity of gas sent out in the twelve months ended June 30 had been 42,740,400 cubic feet, against 41,778,600 feet delivered in the previous year, being an increase of 961,800 cubic feet, or rather over 2·06 per cent. New purifying apparatus had been erected, and one of the gasholders was being enlarged to double its original capacity. Considerable extensions of mains had been made in various parts of the town, and land and property acquired to provide for future extensions of the works. The Directors recommended a dividend of 7 per cent. The general cash account showed that £687 8s. 5d. had been received from the Town Council for gas supplied to the public lamps; £8533 from private consumers; and £1568 15s. 4½d. for coke, tar, &c. These items, together with the amount produced by two calls and the balance brought forward, made a total of £14,797 12s. 3d. Coal, including carriage, had cost £3637 18s. 10½d.; manufacturing wages, &c., £954 19s. 10d.; repairs and renewals at works, £659 8s. 6d.; repairs and renewals of meters, mains, and services, £446 2s. 11d.; rates and taxes, £370 11s. 10d.; salaries, £275; the other items, with a balance of £1739 15s. 3d., making up a total of £14,797 12s. 3d. The capital account showed that the amount received on shares had been £32,863; and there is a mortgage debt of £8166; leaving a balance due to income account of £1984 3s. 2d. The total expenditure on capital account had been £43,013 3s. 2d.]

The Chairman briefly moved the adoption of the report and accounts, and the declaration of the dividend recommended. In doing so he said he thought he might fairly congratulate the Shareholders on the success of the Company's operations in the past and previous years, and for this success he considered they were in a great measure indebted to the exertions of their Secretary and Manager.

Dr. Kelly seconded the motion. The increase in the consumption of gas had, he said, been very considerable, and the Directors trusted the Company's business would continue to progress for many years.

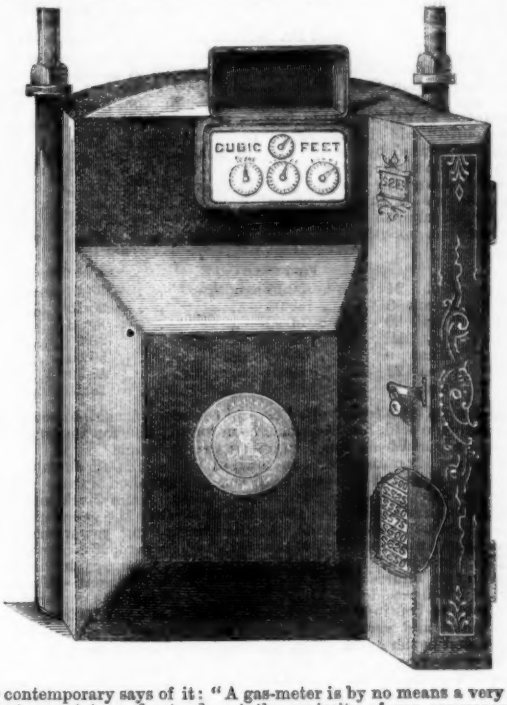
The report was adopted, and a vote of thanks was passed to the Directors for their successful management of the Company's business; the remuneration to be paid to them for their services being increased to £100 per annum.

The retiring Directors and Auditor were then severally re-elected, and after the transaction of some special business the proceedings closed.

The Price of Gas in Manchester and Leeds.—At the meeting of the Manchester City Council on Wednesday last—the Mayor (Alderman Patteson) in the chair—Mr. Chesters-Thompson said he understood that the Leeds Corporation were now supplying gas to their customers at the rate of 1s. 10d. per 1000 feet. The Gas Committee of Manchester handed over to the Improvement Committee of the Corporation a sum of about £50,000 a year, but he found that the Manchester gas consumer paid 40 per cent. more for his gas than the consumer in Leeds. He wished to ask the Gas Committee whether they had yet taken into consideration the question whether they were justified in charging 3s. per 1000 feet for their gas, while in Leeds the charge was only 1s. 10d., and whether the present arrangement was satisfactory to the small consumer. Mr. Harwood, in reply, said the Leeds Corporation were supplying gas if not at prime cost, at perhaps a little less, and this was a policy which the Manchester Gas Committee did not think was sound. He thought it would satisfy Mr. Thompson to know that gas was made in Manchester at as low a price as in any city in England, and that its illuminating power was higher than in most other places. Whatever money was paid over by the Gas Committee was appropriated in some way or other to the relief of the rates, and in whatever profit was made the small consumer participated quite as much as the large. The question might be taken into account whether very large consumers should not have some consideration in price, and this question would, no doubt, shortly come before the Gas Committee. The subject then dropped.

A PRICE INDICATOR FOR GAS-METERS.

The *Scientific American* of the 26th ult. gives an illustration, which we reproduce, of an invention of Mr. Frederick Egner, of Norfolk, Va. It is for a price indicator to be attached to gas-meters, so as always to show, "in dollars and cents," the amount due for gas.



Our contemporary says of it: "A gas-meter is by no means a very difficult instrument to understand, yet the majority of gas consumers are unable to tell, by an examination of the meter, how much gas has been consumed, and the consequence is that disputes frequently arise between the gas manufacturer and the consumer, which might be entirely avoided if some means were provided which would enable the consumer to tell at any moment just how much is due to the manufacturer. The invention is very simple, and may be applied to meters already in use, or it may be made a part of a new meter. It consists of an endless band having printed on it figures, representing dollars and cents, advancing regularly in some fixed ratio. This band is mounted on two rollers in an auxiliary case attached to the meter case, and is driven by a simple train of gearing from the 'hundreds' pinion of the registering mechanism. The gas consumer may at any time know how much he is indebted to the gas manufacturer by noticing the figures visible through an opening in the case containing the endless band. The meter inspector carries a key to the case containing the band, and the latter may at any time be turned back to the zero point by loosening the lower roll; and should the scale of prices be changed, a new band may be supplied at a trifling expense. This invention is well calculated to settle many of the disputes arising between the gas consumer and the gas manufacturer, and it affords an effectual check on meter inspection, ensuring correct statement."

The Purchase of the Lincoln Gas-Works by the Corporation.—At the monthly meeting of the Lincoln Town Council, held on Tuesday last—the Mayor (Mr. F. J. Clarke) in the chair—the agreement entered into between the Lincoln Gas Company and the Corporation for the purchase by the latter body of the gas undertaking was brought up for sealing. The terms of the agreement had all been settled with the exception of one clause. The Corporation proposed that they should take a month for the payment of the dividends which would become due on the 1st of January and the 1st of July in each year; but the Shareholders thought that as they were going to hand over a large sum of money to the Corporation, they ought to pay the dividends when they became due. The agreement was to bear date July 26, 1880, and the Corporation would take the management of the gas-works on the 1st of July next year. The subject gave rise to some little discussion, but on the motion "That the agreement be sealed" being put, only two members of the Council voted against it, three remaining neutral.

Final Meeting of the Nottingham Water-Works Company.—The final meeting of this Company was held last Wednesday—Mr. R. Birkin in the chair. The Clerk (Mr. S. Maples) read a statement of accounts, from which it appeared that out of the funds remaining in the hands of the Company, there had been paid by way of compensation to Directors and Officers, £8170; to the Shareholders, £19,998 0s. 9d.; costs of management and winding-up, £350 8s.; remaining to be paid for final winding-up, £169 7s. 8d.—total, £28,687 16s. 5d., leaving a balance of £1312 3s. 7d., out of the £30,000 in the hands of the Directors at the meeting of the Company on the 5th ult. (See *ante*, p. 144.) This balance remained to be disposed of. Mr. Patchitt moved, and Mr. Lacy seconded, the following resolution:—"That in consideration of the eminent services rendered by the Chairman in the interests of the Shareholders, during the protracted and difficult negotiations between the Water-Works Company and the Corporation of Nottingham, connected with the transfer of the undertaking to the Corporation, the balance in hand, amounting to £1312 3s. 7d., be handed over to the Chairman by the Shareholders, as an acknowledgment of his services;" to which Mr. J. T. Brewster moved as an amendment—"That the balance now remaining, £1312 3s. 7d., moneys received by the Company from the Corporation of Nottingham, be distributed among the several Proprietors of the shares of the Company respectively, and in proportion to their holdings of the same." Mr. Gregory seconded this amendment; whereupon Mr. W. Taylor proposed, and Mr. W. Gibson seconded, a further amendment—"That a sum of £500 be paid to the Chairman, and that the remainder of the £1312 be divided among the other Directors proportionately to their length of service." After considerable discussion, Mr. Brewster's amendment was put to the meeting, and carried. A motion declaring the Company wound up was then passed, and the proceedings closed with a vote of thanks to the Chairman.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual general meeting of the Carluke Gaslight Company was held last Thursday—Dr. Selkirk in the chair. From the annual balance-sheet and report submitted by the Directors it was shown that the affairs of the Company were in a satisfactory condition. Several improvements and additions had been effected on the works during the year. The usual dividend was declared, and Dr. Selkirk and Messrs. Pillans, Smith, Watt, Purdie, and Gilchrist were appointed Directors for the ensuing year.

During the past financial year the quantity of gas made at the Inverness Corporation Gas-Works was 24,985,000 cubic feet, and the quantity sold was 18,705,000 cubic feet. Although the increased make only amounted to 511,000 cubic feet, or 2 per cent., there was an increase in the quantity sold of 1,531,000 cubic feet, or over 8 per cent. This difference was caused by the quantity of unaccounted-for gas being reduced. The illuminating power of the gas over the year was an average of 26 candles, and the number of extra consumers during the year was 62.

Professor J. S. Brazier, reporting on the illuminating power and purity of the gas supplied to the town of Aberdeen by the Corporation during the past six months, gives the following as the results of his experiments:—

	First Observation.	Second Observation.
Jan. 24	30·15 candles.	30·15 candles.
March 6	30·03 ,,	30·10 ,,
April 30	30·20 ,,	30·45 ,,
May 22	29·95 ,,	30·00 ,,
June 5	30·20 ,,	30·30 ,,
June 29	28·10 ,,	28·30 ,,
July 10	28·85 ,,	29·15 ,,

The gas had been tested upon several occasions for sulphuretted hydrogen and carbonic acid, but none had been found; also for ammonia, and mere traces only had been found on one or two occasions.

The Gas Examiner for the town of Greenock (Mr. John Chalmers) reports as follows on the quality of the gas supplied during the month of July, as determined by observations taken at the Clerk and Collector's office, which is somewhere about two miles from the gas-works:—Twenty-five experiments were made, and the illuminating power was—minimum, 25 candles; maximum, 29·40 candles; and average, 26·55 candles.

The Shareholders of the Motherwell Gas Company held their annual meeting on Thursday. In the absence of the Chairman—Mr. J. Russell—Mr. A. Reid presided. A dividend of 6 per cent. was declared, and it was resolved to continue the price of gas at 4s. 2d. per 1000 cubic feet. The Chairman and retiring Directors were re-elected, and a Director was appointed in the room of Dr. Thomson, who had resigned.

At a meeting of the Town Council of Glasgow (sitting as the Corporation Gas Commissioners), held last Thursday, an interesting statement was made by Mr. Walls, the Convener of the Gas Committee, in submitting the annual accounts. He brought out prominently the progress made by the gas supply undertaking by comparing the state of affairs at the present time with that existing in 1870, the first year that the gas supply was under the control of the Corporation. There was now a very large amount in the shape of balance standing to the credit of profit and loss account—namely, £48,000. It would become an important question for the Council to decide how this should be dealt with. While they had made a reduction from the value of the works for depreciation, including all the lands and buildings, of 2½ per cent., he thought a further reduction ought to be made of at least 2½ per cent., from the price at which the works stood in the books. An estimate had been made of the probable results of the working of the various departments during the ensuing year, and, after making a reduction of 2d. per 1000 cubic feet in the price of the gas, it was anticipated that there would be a surplus of about £7000. With reference to the subject of dealing with the £48,000, it had been suggested that out of the gas profits a sum might be set aside for the general purposes of the Corporation. As a rule, he had always objected to that, and whatever might be done at present he hoped would not be taken as a precedent. In conclusion, he gave notice of the following motion:—"That a further reduction of 2½ per cent. be written off all the works except meters, and charged to profit and loss; also that the sum of £5000 be handed over for the general purposes of the Corporation, on the condition that a similar amount be applied to the improvement of George Square." The Lord Provost remarked that the statement of savings by Mr. Walls was very satisfactory indeed. A great deal of the saving was due to the Works Committee, and especially to the Convener of that Committee, who had given no ordinary amount of attention to the work. The whole of the members of the Gas Committee had taken the greatest interest in their work, and to the attention of those gentlemen the satisfactory result recorded was largely due. Ex-Bailie Lamberton remarked that the meter account, which stood at £140,000 two years ago, had been reduced to £131,000, while the efficiency and maintenance of the meters had been attended to, the Committee having expended £2000 more last year in the repair of meters than formerly. The minutes were approved of, including the proposal to reduce the price of gas from 3s. 10d. to 3s. 8d. per 1000 cubic feet.

Business was done last Wednesday in the stock of the Edinburgh and Leith Gas Company at £32 per share.

The annual official inspection of the Loch Katrine Water-Works was made by the Glasgow Corporation Water Commissioners on Friday and Saturday, the 30th and 31st ult. About 40 of the Commissioners, accompanied by the leading officials and a few friends specially invited, went the round of the works, beginning with the Mugdock reservoir and the straining well, and terminating with the works at Loch Vennachar on Saturday. Most of the party remained at the Trossachs Hotel over Friday night.

It seems that a large number of the ratepayers of Hawick are dissatisfied with the decision of the Town Council to proceed with the Dodburn water supply scheme. They have already held one public meeting on the subject, and are about to hold another; but it is not likely that the opposition will have much, if any, influence with the Town Council. The agitators are in favour of what they believe to be a cheaper and better scheme.

Last week's Glasgow pig iron market was very firm. Up to 55s. 6d. cash was paid on Wednesday, but at the close of the week a reaction set in, owing to some heavy realizing, and on Friday afternoon as low as 54s. 4½d. cash was quoted by sellers.

The local trade in coal is very meagre, and a good deal of the shipping demand is being met from the Ayrshire ports, owing to the strike now prevailing in Lanarkshire.

NEWCASTLE-UNDER-LYME GAS COMPANY.—The annual meeting of this Company was held on Thursday, the 29th ult. Mr. W. Hargreaves, Chairman of the Directors, presided. The report of the Manager (Mr. W. Winstanley) and a statement of accounts having been read, the usual dividends were declared—viz., 10 per cent. on the original shares, and 7½ and 7 per cent. respectively upon subsequent issues.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district, if actually no worse, is certainly in no better position since my last report, and there is still an absence of any indication of early improvement. The production of round coal throughout the district continues much in excess of requirements, notwithstanding the almost general restriction of the output, and the knowledge that there are not only large stocks in the district; but that there is also a readily available means of largely increasing the present production, naturally encourages buyers of gas coal to hold out as firmly as ever for long forward contracts at extremely low prices. The strong position which gas coal consumers have taken in this respect has, in some cases, induced the principal colliery firms, who were previously holding out against long contracts, to give way, and during the past week or so contracts have been settled by one of the largest firms in Lancashire for deliveries extending over five years, but in this case a somewhat higher price has been obtained than they were willing to take for a twelvemonth's contract, beyond which they had previously declined to quote. The contracts for the Salford Gas-Works have not yet been settled, the Corporation, I understand, having made arrangements for submitting samples to further tests. So far as prices can be ascertained, they average about 6s. 6d. per ton for best screened Lancashire gas coal at the pit; but there is a good deal of Wigan four-feet coal being sold for gas-making purposes at under 5s. per ton at the pit. Manchester district cannel is quoted at about 11s. 6d. per ton at the pit, and good Wigan cannel can be bought at about 14s. 6d. per ton; but there are inferior descriptions of cannel offering in this market from outside districts at much lower figures, tenders for Nottinghamshire cannel having been made for delivery equal to Manchester at from 9s. to 12s. per ton.

In other descriptions of round coal the market has undergone no material change. House fire coals do not meet with any improved demand, and the better classes especially are bad to sell, with a good deal of stock going down. At some of the best coal collieries Arley is still quoted at about 8s. to 8s. 6d. per ton at the pit; but good qualities are to be readily bought at 7s. to 7s. 6d. per ton, and common sorts at about 6s. per ton, with Pemberton four-feet coals ranging from 5s. 6d. to 6s. 6d. per ton according to quality. Common round coals still meet with only a very dull demand for either steam or manufacturing purposes, and are extremely low in price, sellers being plentiful at from 4s. 6d. to 5s. per ton at the pit. Engine fuel is steady in price, owing to the limited production of slack; good burgy fetching from 4s. to 4s. 3d., and good slack 3s. 6d. to 3s. 9d. per ton at the pit.

In the iron trade prices are still very firm, but so far as consumers in this district are concerned, the demand is only limited. Local makers of pig iron are securing a considerable proportion of any business offering, and their quotations are firm at 50s. per ton, less 2½, for No. 3 foundry, and 49s. for No. 4 forge, delivered into the Manchester district. Finished iron makers are busier, and Lancashire bars delivered into the Manchester district now average about £6 5s. to £6 10s. per ton.

It has long been a matter of complaint amongst Lancashire colliery proprietors that as regards the London market they are placed at a disadvantage with other districts, by the comparatively high railway rates which are at present charged, and an effort is being made by the South Lancashire and Cheshire Coalowners Association to obtain some concession in this direction from the London and North-Western Railway Company.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The output of coal in the South Staffordshire district has not materially increased of late, and so far the hopes of a substantial increase which were held at the commencement of the quarter have not been realized. Notwithstanding the fact that the mills and forges are running full time, there have been but few good and businesslike contracts made. The doubts held by the manufacturers of the continued improvement are such as to preclude them from entering into transactions other than of a hand-to-mouth character. The demand for gas coal is, however, of a satisfactory nature, and some good contracts continue to find their way into this locality. Domestic qualities are not so much sought after, and those receiving the greatest call are of the thick class. Prices are no stronger; but continue about the same for all kinds. Ironstone and other minerals are receiving more attention, and several large sales have been made during the week.

The Mines Drainage Commissioners on Friday last issued a circular to the owners and occupiers of mines in the Tipton district, calling their attention to the serious consequences which would ensue if the steps that are being taken to exempt that district from the operation of the Board were successful, and soliciting their voice in opposing the undertaking. This subject is one in which great interest is being taken by both the coal and iron masters hereabouts. The result of the working of the Hamstead Colliery is said to have shown that there is an abundance of thick coal, fully equal in quality to that of the old South Staffordshire kind, and the Company have resolved to increase the capital to £260,000.

The iron trade continues to show a slight improvement; during the week some good business transactions have taken place at prices satisfactory to makers. There is, however, still a disposition to withhold orders, which arises from the belief that prices have been unduly forced up. One house—namely, that of Messrs. Williams and Co.—have issued notices of a reduction of 10s. per ton on their "mitre" brand. They are, however, a single exception, and there are no other firms making such a reduction. Most of the pig makers are fairly employed, and there are but few to be found with any bulk of stock on hand. At Birmingham, on Thursday, one firm booked an order for 1000 tons of pig iron at satisfactory prices, and attempts were made to place a few other extensive lines. The Wolverhampton market was well attended on Wednesday, and a steady trade was done. Though not numerous, orders were placed for several qualities of manufactured iron at remunerative rates, and a good number of inquiries were reported. Marked bars were firm, and, with the exception of the firm above mentioned, no reductions were notified. Unmarked qualities changed hands at £6 10s. to £7 10s., though £6 15s. was a price at which several parcels were placed. The demand was greatest for galvanizers sheets, which were held especially firm, and only a few sellers were willing to take orders at existing rates. All-mine best-class pigs realized £3 10s.; and in a few instances £3 15s. was reached. The average rate at which part-mine were booked was £3, and cinder pigs were quoted at £2 2s. 6d. Heavy ironfounders are tolerably well occupied, and the operations include a very fair average of work for the foreign market—of which Indian railway requirements are conspicuous. Boiler and tube makers report a slight improvement in business for the present quarter over the past.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade throughout the greater part of the county does not exhibit any material alteration. In some of the heavy branches devoted to castings there is a pretty good trade, but builders and miscellaneous

work is yielding but little employment. There is but little change to record with respect to the output of pig iron. Most of the furnaces which have been in blast for some time are still at work, but the output exceeds the demand. The tonnage of ironstone raised in the district is very small, and the greater portion of what is used has to be obtained from North Lincolnshire, where supplies are not only ample, but within a few feet of the surface. There still continues to be a fair business done in Bessemer steel rail and tires at the Penistone works and other places in the county.

The steam coal trade is about the only branch where anything like a fair business is being done. Most of the pits raising a good tonnage of steam coal are sending largely to Hull. The collieries in the West Yorkshire district are doing a fair trade, Allerton Main having sent 2331 tons during last month by rail and water. The West Riding and Silkstone pits are accredited with 10,589 tons. Fryston Main and Glass Houghton figure the most conspicuously amongst the West Riding pits; the former forwarded 3220 tons, and the latter 1448 tons during July. By far the largest tonnage is, however, sent from the collieries in the South Yorkshire district. Denaby Main, which colliery is the nearest to Hull, is sending largely by water, 8460 tons having passed by that route, and 3936 tons by rail. From Elsecar 3044 tons were sent by water, as well as 3688 tons from Manvers Main by the same route. Shireoaks is a large contributor by water; Swaithe Main, Whitwood, Kilnhurst, and Roundwood by rail.

The demand for house coal is very feeble, and but a limited tonnage is being sent over the Midland and Great Northern routes to the Metropolis. There is also a very quiet business doing with the Eastern Counties and other markets to which coal is supplied. At some of the pits the soft coal is being stacked in order that the orders for "hards" may be met. Prices are still low, and no change is likely to be recorded for at least some months to come.

Manufacturing coal and gas fuel are in fair request, the latter being more largely supplied to the various gas companies than it was a few months ago. Some of the pits working the Silkstone seam have more inquiries for this class of fuel than they have had, owing to the low prices at which supplies can be procured.

A further falling off must be recorded in the coke trade, and this being the case, prices are giving way. As has been several times intimated in my reports, the new ovens which have been erected in the county are not nearly all at work. In some instances, where new ones have been dried, they have never been put into further use, owing to the falling off for smelting purposes. The quantity sent to North Lincolnshire is on the wane, although the quality of the coke at present made is much superior to what it was a few years ago.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England is comparatively dull, and the demand for every description of fuel moderate. As regards steam coals, the prospects for farther on in the season are most unsatisfactory, the gas collieries being mainly engaged in working coals which have been contracted for over the year. The best pits are well employed; but the business which is doing in the open market is not large. Seaborne house coals are not much looked after. They are low in price, and are very bad to sell. The demand for coke is dull just now, as nearly all the contracts have been arranged. The quoted prices of coals generally remain about the same; but in many instances larger discounts have to be allowed to enable collieries to make a market.

The coasting freight market continues in a depressed state. Rates are miserably low for London, the east coast and the Channel ports. A limited business is doing in gas coals to Ireland. Steamers continue to take gas coals out to the Baltic; but the home business has not commenced. It does not usually do so for the bye-ports until after the harvest. As there is an abundance of small second-class steamers pressing on the market, it is rather improbable that there will be much alteration in the rates over the autumn. The market favours shippers.

In the North of England and Cleveland iron districts the trade has been quiet but steady, and prospects are looked upon as encouraging. Prices have improved a little. Makers are well supplied with orders for some weeks to come, and decline to sell further forward. All descriptions of metals are stronger. Lead has advanced about £1 a ton. Rich Spanish brought £17 per ton on the Tyne; Greek, £16 2s. 6d.; and English, £17 per ton. Merchants are disposed to hold.

In the manufacturing iron trade, ironfounders are receiving more inquiries, and finished iron manufacturers have enough to keep them going for a couple of months. The demand for fire-clay goods, especially second-class sorts, is not quite so strong; at the same time shipments are very well sustained. The chemical trade of the Tyne and adjacent district is dull. The market was quiet last week; but, on account of the stocks being low, prices remained nominally unaltered. There have been considerable arrivals of timber of all descriptions in the north-eastern ports. It is very well selected. There is no excess of any kind over consumptive demand, and it is going off very well. Prices do not alter, and the market is void of speculation.

CHARD GAS COMPANY.—The Directors of this Company have just declared a dividend of 5 per cent. and a bonus of 2½ per cent. on the profits of the past year's working.

THE PROPOSED PURCHASE OF THE FOLKESTONE WATER-WORKS.—In reference to this question, to which we recently referred, one of the Kent county papers says: "The purchase of the water-works by the Corporation is discussed with considerable interest, and any very easy negotiation in the matter is not thought to be feasible. The amount of capital of the Company is not far short of £100,000, and as the £10 shares have fetched, only recently, £20, the purchase of the property will probably be based on something like the sum of £200,000."

THE COSTS OF THE OPPOSITION TO THE EXETER GAS BILL.—At a meeting of the Exeter Town Council, on Wednesday last, the Town Clerk read a letter he had received from Mr. G. Norton, the Parliamentary Agent of the Council, in reference to the costs incurred by the Corporation in promoting their abortive Bill last year to purchase the works of the Exeter Gas Company. Mr. Norton stated in the letter that he should be happy to give up half his charges, which amounted to about £90, on receiving a cheque for the balance. Mr. Wilkinson asked whether the remainder would be a legal charge upon the rates, and the Town Clerk replied that the amount would have no effect whatever upon the legality or illegality of the charge. It was agreed that a letter be written to Mr. Norton, thanking him for his offer, which was stated to have been quite a voluntary one.

DEATH OF MR. BLAKELOCK SMITH, OF SHEFFIELD.—We regret to have to announce the death, on the 1st inst., of Mr. Ralph Blakelock Smith, for many years the Law Clerk of the Sheffield Water-Works Company, to which office he succeeded his father, and the onerous duties of which, especially in connection with the investigation of the claims arising out of the failure of the Dale Dyke reservoir in 1864, entailed upon him severe labour. Towards the end of 1875 Mr. Smith was attacked by serious illness, which for a time arrested his labours, and from which it was scarcely expected he would recover; and although he was subsequently able to resume his place as legal adviser of the Company, it was obvious that it was with restricted energies. He was taken ill at his office on the Wednesday before his death, and although everything possible was done for him by his medical attendant, he gradually succumbed. The deceased gentleman was in his 57th year.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

3028.—FOXALL, J., Newport, Monmouth, "Improvements in dry gas-meters." July 23, 1880.

3090.—IMSCHENETZKI, M. G., A. M., and S. M., St. Petersburg, "Improvements in rotary engines, pumps, blowers, and fluid-meters." July 27, 1880.

3107.—NAWROCKI, G. W. VON, Berlin, "Improvements connected with the hydraulic main used in the distillation of gas." A communication. (Complete specification.) July 28, 1880.

3112.—WILKINS, F., Southampton Buildings, London, "Improvements in apparatus for producing light and heat by the combustion of hydrocarbon oils or other inflammable liquids and gases." July 29, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

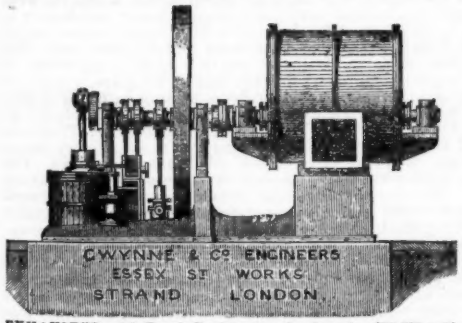
422.—LYON, T. G., Peckham, London, "Improvements in the construction of water-pipes for the purpose of preventing injury to the same by the action of frost." Jan. 30, 1880.

457.—MEWBURN, J. C., Fleet Street, London, "Improvements in or applicable to gas lamps and burners." A communication. Feb. 2, 1880.

499.—BOWER, G., and A. S., Saint Neots, Huntingdon, "Improvements in lighting with compressed gas, and in the apparatus employed therein, especially applicable to railway and other carriages, ships, buoys, and isolated buildings." Feb. 4, 1880.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

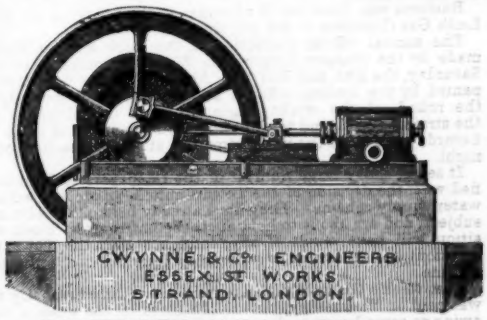
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horisontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by a Young Gentleman, thoroughly educated in the Manufacture and Distribution of Gas, Main and Service Laying, Retort-Setting, Parliamentary Tests, and all matters of detail, an Appointment in a Gas-Works. Fair Draughtsman and quick at Figures. Excellent references.
Apply to W., 54, Hardress Street, RAMSGATE.

WANTED, by the Advertiser, aged 36, a Re-engagement as WORKING MANAGER of a Gas-Works. Thoroughly active and experienced in the Setting of Retorts, Main and Service Laying, Fitting, and the Repairing and Testing of Meters. Six years in present situation. References and testimonials.
Address No. 681, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Manager of a medium-sized Gas-Works or ASSISTANT MANAGER in a large Gas-Works. Advertiser has a thorough Practical Knowledge of the Manufacture and Distribution of Gas, and had for several years the entire Management of a Gas-Works abroad, which always gave good results. Has also a good Knowledge of Gas Engineering in all its branches, and was for many years a Draughtsman previous to going abroad. Satisfactory reasons for leaving last situation. First-class testimonials and references.
Address No. 671, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser requires a Situation as GAS-FITTER and METER-FIXER, is accustomed to the General Work in the Gas-Works.
Address THOMAS J. WALKER, Herne Cottage, Snakes Lane, WOODFORD.

FOREMAN or Inspector, Situation wanted by an active and experienced Mechanic, aged 36. Understands the Manufacture of Gas, Laying of Mains, and Services, Fixing and Repairing of Wet and Dry Meters. Six years in present employ. References and testimonials.
Address No. 682, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the 4th of September, a steady, experienced Working Man, to take sole Charge of small Gas-Works.
Address, stating qualifications and references, to Mr. R. COVINGTON, Secretary, Gas Company, Ticehurst, HAWKHURST.

WORKING FOREMAN Wanted, must understand the Manufacture of Gas, taking the State of Meters, and be able to do Internal Fitting. Wages 25s. per week, with house, coal, and gas free.
Applications to be addressed to the MANAGER, Gas-Works, Hednesford, STAFFORDSHIRE.

OLDBURY BOARD OF HEALTH GAS-WORKS.

CLERK OF WORKS REQUIRED.

WANTED, by the above Board, a Person accustomed to Inspecting and Superintending Building Operations, the Erection of Gas-Works, and to act as CLERK of WORKS.
Applications, with testimonials, stating age and amount of salary required, to be sent to Mr. A. Upward, 8, Queen Anne's Gate, Westminster, S.W., not later than the 14th of August inst.

By order,
A. WRIGHT, Clerk to the Board.
Board-Room, Oldbury, Aug. 6, 1880.

MANAGER OF GAS-WORKS WANTED.

THE Bridgnorth Gas Company, Limited, will shortly have a vacancy for a Manager of their Gas-Works. Annual make of gas about 12 millions. Salary, with house, coal, gas, and garden free, £2 2s. per week.
Applications to be sent in by the 18th of August.
For further particulars apply to the SECRETARY, Mr. J. H. Cooksey, Town Clerk's Office, BRIDGNORTH.

WANTED, a Working Foreman in a small Gas-Works, competent to attend to minor Repairs, to Superintend larger Mechanical Operations, and the Meter Department. He will be required to fill up his time in Office work.
Apply, stating terms required, to W. JARVIS, Manager, Gas-Works, KINGSBRIDGE.

ACCOUNTANT WANTED.

WANTED immediately, by a Gas Com- pany in South Wales, a thoroughly experienced and efficient ACCOUNTANT, who will have to undertake the entire duties, and the Preparation of the Half-Yearly Accounts, in accordance with the most improved system of Book-keeping. Salary £150 per annum.
Applications (in own handwriting, to state age, present and past engagements, accompanied with copies of testimonials) to be addressed to No. 680, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee of the Corporation of Manchester require the Services of an Efficient DRAUGHTSMAN, who has a thorough Practical Knowledge of Gas-Works, and is competent to undertake the Preparation of Plans in connection with the Construction and Alteration of the various Works and Apparatus used in the Manufacture of Gas, and who has a good Knowledge of general Engineering Work.
Applications, stating age, experience, and salary required, and accompanied by testimonials, must be addressed to the Chairman of the Gas Committee, endorsed "Application for Appointment as Draughtsman," and delivered at the Gas Office, Town Hall, on or before Saturday, Aug. 21, 1880.

By order,
JOS. HERON, Town Clerk.
Town Hall, Manchester, Aug. 3, 1880.

WANTED, a Photometer, new or second-hand, complete; in good working order.
State kind, price, and other particulars to JAMES MEARNS, Gas-Works, Banbridge, IRELAND.

WANTED, a Second-hand Gas Tank and Holder, 40 ft. diameter, 14 to 16 ft. deep; in perfect order, complete ready for erection.
Price to include delivery alongside ship, Liverpool or London.
Tenders to be addressed No. 670, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-Hand Engine and EXHAUSTER, to pass from 5000 to 8000 feet per hour. Also one Cornish Boiler (Second-hand) 8 or 9 ft. long by 3 ft. 6 in. or 4 ft. diameter.
Particulars and prices, including delivery on railway truck, to be addressed to No. 679, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Two Purifiers, 6 ft. by 2 ft. 6 in., by 2 ft. 6 in.; with Two Four-way Valves and Connections.
One 1000 ft. per hour Station-Meter, with Valves and Connections.
One 4-in. Governor, with Valves and Connections.
Four Lengths of 15-in. Hydraulic Main for beds of four, three, two, and one retort, with Bridge and Ascension-Pipes, 4-in. diameter.
Apply to Mr. J. ESCOTT, Gas Company, Llantrisant, GLAMORGANSHIRE.

ON SALE—The Cast-Iron Fire Doors, Mouthpieces, Ascension, H, and Dip Pipes, Hydraulic Mains, &c., belonging to six settings of six retorts; One Station Meter to pass 8000 feet per hour (makers West and Gregson); also nine D-shaped clay retorts, 16 in. by 14 in. by 8 feet.
The above are in capital condition, and can be seen at the Gas-Works, Guildford. No reasonable offer refused.
Further particulars on application to Mr. LONGWORTH, Gas Offices, GUILDFORD.

R. ANDREWS, Retort Setter, 17 years practical experience. Estimates given for Building new Benches.
References and prices on application at 114, Elsley Road, Shaftesbury Park Estate, LONDON, S.W.

FOR SALE—Gasholder, 158 ft. by 30½ ft. in good condition (single, but could be telescoped) to be taken out early next year, and replaced by S. C. & Sons with a Treble Lift. Excellent Guide Framing, consisting of 20 handsome Columns and wrought-iron Girders. May be seen at work at the Gas-Works, Portsea.
Particulars on application to S. CUTLER AND SONS, Millwall, LONDON, E.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—
SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.
STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse powe with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

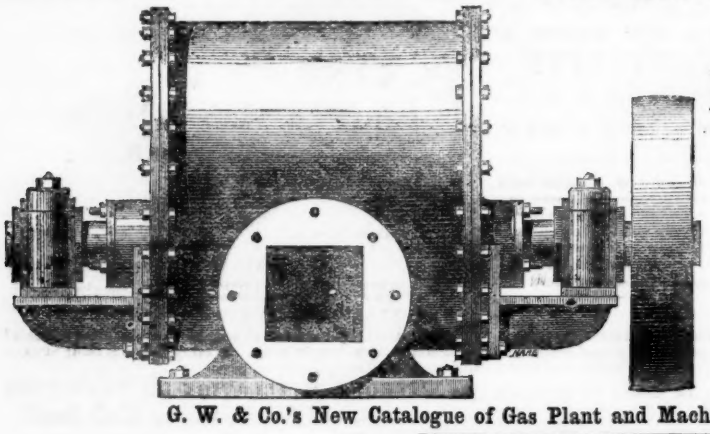
HEYWOOD GAS-WORKS.

TO ENGINEERS AND IRONFOUNDERS.

THE Heywood Local Board invite Ten- DERS for the following:—
Contract No. 2.—The Cast-Iron Columns, Main and Secondary Beams and Girders, &c., required in the Erection of a Purifying House, and the fixing of same.
Contract No. 3.—The wrought and cast iron work, &c. of a Purifying House Roof and the erection of same.
The Drawings and Specifications may be seen at the Board's Offices, and at the Offices of the Engineer, Mr. Thomas Newbigging, 5, Norfolk Street, Manchester.
Copies of the Specification, bills of quantities, and forms of tender may be obtained from the Engineer on payment of one Guinea for each contract, which will be returned on receipt of a *bona fide* tender.
Sealed tenders, endorsed, "Purifying House, Contracts Nos. 2 and 3," to be addressed to the Chairman of the Gas Committee, and delivered to me not later than the 12th of August.
The Board do not bind themselves to accept the lowest or any tender.

By order,
JOHN BANKS, Clerk to the Board.
Offices, Heywood, July 29, 1880.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT
WROUGHT-IRON SPINDLES AND
ENGINES COMBINED.

GEORGE WALLER & CO.,
MAKERS OF
ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:
HOLLAND STREET, SOUTHWARK, S.E.

SOUTH METROPOLITAN GAS COMPANY.

589, Old Kent Road, S.E.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the PROPRIETORS of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 25th of August inst., at Two o'clock in the afternoon precisely, to receive the Directors Report, and the Accounts of the Company for the half year ended the 30th of June last, and to declare a Dividend for the same period.

The Transfer Books will be closed from the 11th of August until after the meeting.

By order,
GEORGE LIVESEY, Secretary and Engineer.

Aug. 3, 1880.

THE MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is hereby given that the TWENTY-SEVENTH ORDINARY HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of this Company will be held in the Board-Room at the Works, Mitcham, in the County of Surrey, on TUESDAY, the 31st day of August, 1880, at Three o'clock in the afternoon precisely, to declare a Dividend for the half year ended the 30th day of June, 1880, and for general business.

The Transfer Books will be closed from the 16th to the 31st day of August inst.

By order,
BENJAMIN GREEN, Secretary and Manager.

Board-Room, Mitcham, Surrey, Aug. 5, 1880.

CITY OF HEREFORD.

THE Gas Management Committee of the Hereford Corporation hereby invite TENDERS for the Purchase of the Surplus TAR produced at their new Works, from the 1st day of January, 1881, to the 1st day of June, 1883. The quantity will be about 200 tons per year.

The Committee will provide for the pumping into tank waggons, on rail in their sidings, which are in connection with the Great Western Railway.

Tenders, endorsed "Tender for Tar," are to be sent to the undersigned on or before the 23rd of August next.

The said Committee do not bind themselves to accept the highest or any tender.

By order,
WILLIAM DAVIS, Engineer.

Gas Office, Hereford, July 27, 1880.

THE BROMLEY GAS CONSUMERS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Tuesday, the 24th day of August inst., at Six o'clock precisely, to receive the report of the Directors, the balance-sheet confirmed by the Auditors, to declare a dividend, and for general business.

By order of the Board,
GEORGE H. OSBORN, Secretary and Manager.

Offices at the Works, Bromley, Kent, Aug. 5, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Kingston-upon- Thames Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works from the 1st of September, 1880, to the 30th of June, 1881. The probable quantity will be about 100,000 gallons.

Further particulars may be obtained of Mr. H. F. Packham, Engineer, Gas-Works, Lower Ham Road.

Tenders will be required to be sent in, addressed to the Chairman, not later than Wednesday, the 25th of August, 1880.

The Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. FRICKER, Secretary.

IMPORTANT to GAS COMPANIES.

MESSRS. JOHN ABBOT & CO., LIMITED,

OF SUFFOLK LANE, LONDON, AND GATESHEAD,

Manufacture and Erect

SULPHATE PLANT

On the most Modern and Improved Plan.

EXAMPLES

Can now be seen at

NEWCASTLE, CARLISLE,

And will shortly be erected at the New Gas-Works,

TUNBRIDGE WELLS.

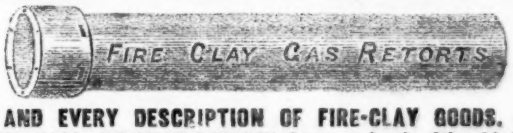
ANTI-CORRODO TUBES
(BARFF'S RUSTLESS PROCESS)

See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.

THE RUSTLESS AND GENERAL IRON COMPANY
(JAMES E. AND SAMUEL SPENCER),
Makers of ANTI-CORRODO (BARFF'S) TUBES AND FITTINGS
For Gas, Steam, and Water; also Black Galvanized and Enamelled.

WORKS:	*Quotations and Pamphlet on application to*	LIVERPOOL OFFICE
West Bromwich.	97, CANNON STREET, LONDON, E.C.	34, Moorfields.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,
RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

THE
THAMES BANK IRON COMPANY,
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES,
FLANGE-PIPES FOR STEAM,
RAIN-WATER PIPES AND GUTTERS,
HOT-WATER BOILERS, PIPES, AND CONNECTIONS,
LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,
HOT WATER AND HOT AIR APPARATUS,
Erected complete on the most Improved Principles.

THE Stretford Gas Company are pre- pared to receive TENDERS for the GAS TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for a period of Two or Three years, commencing on the 1st of November next.

Tenders to be sent in addressed to the Chairman, and endorsed "Tender for Tar, &c.," on or before Monday, Sept. 6 next.

The Directors do not bind themselves to accept the highest or any tender.

Arrangements can be made to load the same in boats alongside the Works.

BENJAMIN HAYNES, Secretary.

Stretford, near Manchester, July 17, 1880.

WIDNES GAS-WORKS.

THE Widnes Local Board invite Tenders for the Purchase of the TAR and AMMONIACAL LIQUOR produced at their Works, for a term of Twelve months from the 1st of October next.

Tenders, endorsed "Tar" or "Liquor," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be delivered at the above Works (where conditions of contract can be obtained) not later than the 2nd of September next.

The Board do not bind themselves to accept the highest or any tender.

HENRY ROBERTS.

Gas-Works Offices, Widnes, Aug. 9, 1880.

LEEK IMPROVEMENT ACT, 1855.

THE Leek Improvement Commissioners invite TENDERS for 500 3-in. Cast-Iron Socket PIPES, with bead on spigot end, each Pipe to weigh 112 lbs., and work 9 ft. exclusive of socket. The Pipes to be coated with Smith's Composition, tested with 700 ft. of water, and delivered at the Leek station on the North Staffordshire Railway.

Tenders to be received before Four o'clock in the afternoon of Monday, the 16th of August inst., addressed to the Chairman of the Water Committee, Leek.

By order of the Commissioners,
C. HENSHAW, Clerk.

Public Offices, Leek, Aug. 4, 1880.

TO BUILDERS, GAS APPARATUS MANUFACTURERS, AND OTHERS.

THE Teignmouth Local Board are ready to receive TENDERS for the EXTENSION of their GAS-WORKS by Building a Manager's Dwelling-house, Boundary Wall, and Coal Store, and providing and fixing Condensers, Scrubbers, Purifiers, Station-Meter, Governor, Horizontal Engine, Boiler, &c.

Plans and Specifications may be seen and particulars may be obtained of THOMAS DAND, C.E., Castle Street Chambers, Exeter.

Sealed Tenders endorsed "Tender for Gas-Works Extensions," to be delivered at my Office on or before Monday, Aug. 9, 1880.

The Local Board do not bind themselves to accept the lowest or any of the tenders.

By order of the Teignmouth Local Board,
W. R. HALL JORDAN, Clerk.

Teignmouth, July 27, 1880.

WATER-WORKS CONTRACTS FOR THE WALTON-LE-DALE LOCAL BOARD DISTRICT.

THE above Board are prepared to re- ceive TENDERS for the following WORKS for the Water Supply of their district, according to drawings and specifications prepared by Mr. Charles Tomlinson, Hadley House, Rotherham, the Engineer for the Works.

Contract No. 1.—For Well and Boreholes.

Contract No. 2.—Pair of Pumping Engines and Boilers, with Pumps and Appurtenances.

Contract No. 3.—Engine and Boiler Houses, Cottage, and covered Reservoir, &c.

Contract No. 4.—About 700 Tons of Cast-Iron Pipes, ranging from 10 in. to 3 in. diameter.

Contract No. 5.—Laying and Jointing, &c., Pipes, and finding and fixing Sluices, Hydrants, &c.

A printed copy of the specifications for any of the Contracts, and schedule of prices and form of tender, can be had on payment of One guinea, on application at the Offices of the Local Board, School Lane, Walton-le-Dale, near Preston, Lancashire, on any day from the 16th to the 21st day of August, during the hours from 10 a.m. to 4 p.m.

Tenders on form provided, with prescribed schedule of prices, to be addressed to the Chairman of the Board, and sent to the undersigned on or before 2 p.m. on Saturday, the 28th of August, 1880.

W. AND A. ASCROFT,
Clerks to the Board.

4, Cannon Street, Preston.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF
KING'S TREATISE
On the Science and Practice of the Manufacture and Distribution of
COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

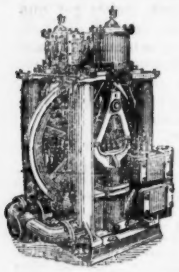
Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

WOOD
TROUGHING
For Preserving Service-Pipes.
Price from Three-Farthings per Foot
In any Lengths.
THOS. PROUD,
Brookfield Works, Icknield St., Birmingham.

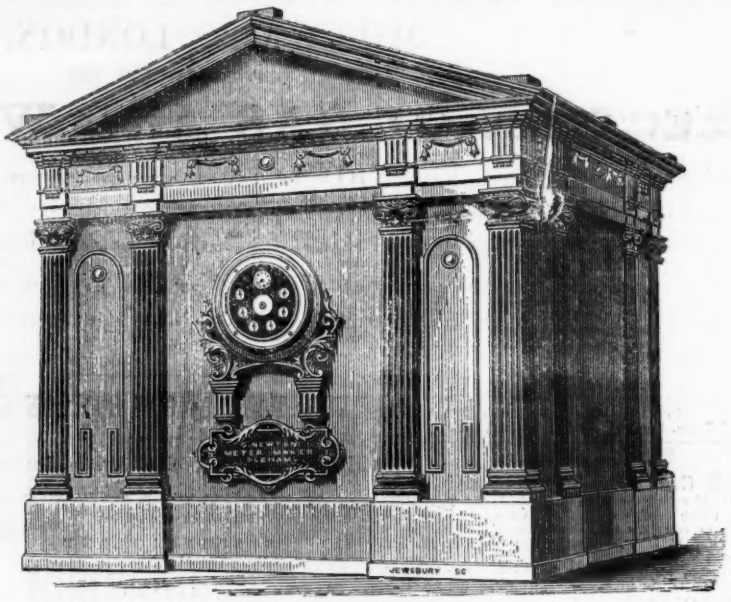
STEPHEN HOBBS,
OF
CLARENCE VILLA, RAMSGATE,
CONTRACTOR FOR WELL SINKING
AND
SEWERING WORK GENERALLY,
Begs to inform Engineers and others that he has just completed the extensive and important excavations, amounting to 4000 cubic yards, for the Ramsgate Improvement Commissioners (under the direction of their Engineer, Mr. Valon), whereby a good and abundant supply of water has been obtained, and is now in a position to undertake further work in town or country.
References kindly permitted to be made to Mr. William A. Valon, C.E., Ramsgate. Additional testimonials if required.

John Cameron's Specialities



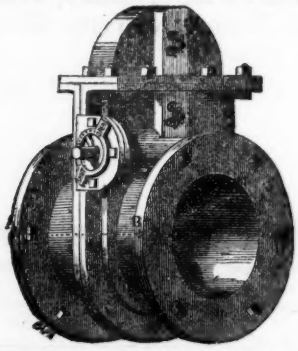
ARE HIS
PATENT LEVER
PUNCHING MACHINES
AND HIS
STEAM-PUMPS
FOR
GAS-WORKS,
Feeding Boilers, Steam Fire-Engines, Colliery Deep Lifts, Irrigation, Contractors, and Chemical purposes.
Works:
OLDFIELD ROAD, SALFORD, MANCHESTER.

GEORGE NEWTON,
UNION STREET WEST, OLDHAM,



MANUFACTURER OF
SQUARE STATION-METERS, with PLANED JOINTS;
ROUND STATION-METERS, with CAST-IRON STANDS;
WET AND DRY CONSUMERS GAS-METERS, GOgovernors, &c.

B. DONKIN & Co.'s
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

Also Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS, STEAM-ENGINES for Driving Gas Exhausters,
VALVES FOR AMMONIACAL LIQUOR, TAR, &c., IMPROVED BRIDGE VALVES for Regulating the Seal in Hydraulic Mains, so arranged that when once adjusted for the proper overflow they can be closed entirely and opened again without altering the adjustment.
GAS THROTTLE-VALVES, SPECIAL GAS-VALVES with Columns, Gauges, &c.
BYE-PASS VALVES, SCREW WATER-VALVES, &c., &c.

B. DONKIN & Co., BERMONDSEY, LONDON, S.E.

ECONOMY IN THE PRODUCTION OF GAS.
PLUTONIC CEMENT,
For Jointing and Repairing Retorts and Ovens *in* Action and *out* of Action.
Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

WARNER'S RETORT-HOUSE MACHINERY.
[*As Illustrated and Described in the* Journal *for May* 4.]
Communications to be addressed to
W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

SAMUEL CUTLER & SONS,

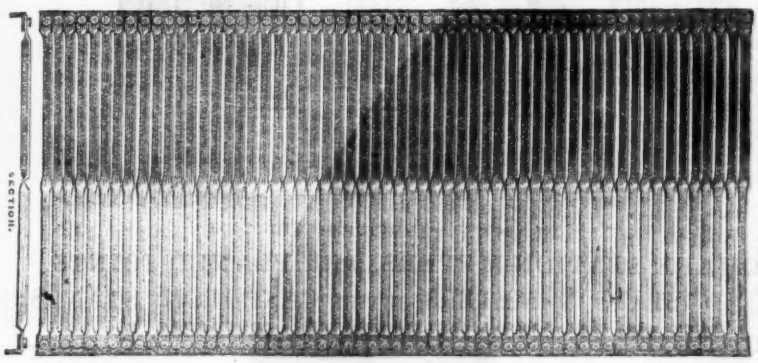
MILLWALL, LONDON, E.,

CONTRACTORS FOR THE

ERECTION OF GAS AND WATER WORKS,

Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

S. C. and SONS supply *every* requisite for Gas-Works, and keep in stock Small Articles, such as BARROWS, SCOOPS, RETORT-LIDS, BOLTS, &c.; and they manufacture WOOD SIEVES of a very superior description.



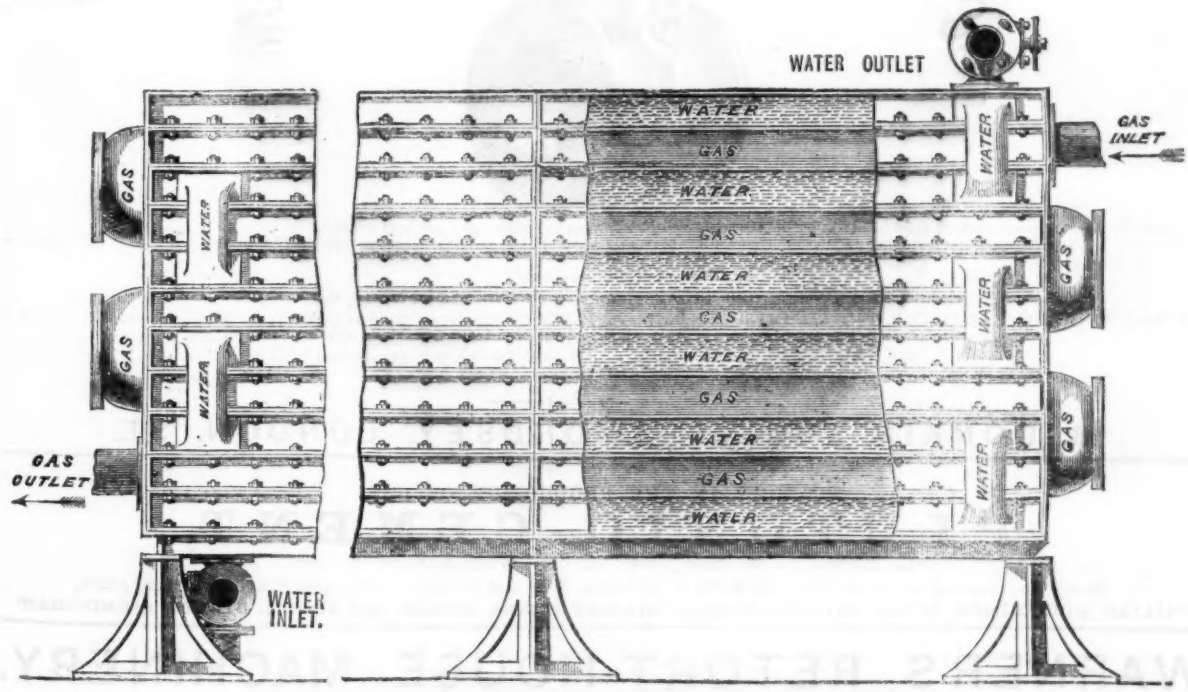
CUTLER'S PATENT WATER-VALVES
Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.
Full Particulars on Application.

CUTLER'S PATENT SIEVES
Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.
Copies of Testimonials on Application.

MORRIS AND CUTLER'S PATENT CONDENSERS

Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



Also CUTLER'S PATENT MOUTHPIECE SUPPORTS,
AND
CUTLER'S PATENT REMOVABLE DIPS.
[*See* JOURNAL for Nov. 25, 1879.]

WILLIAM SUGG'S

IMPROVED

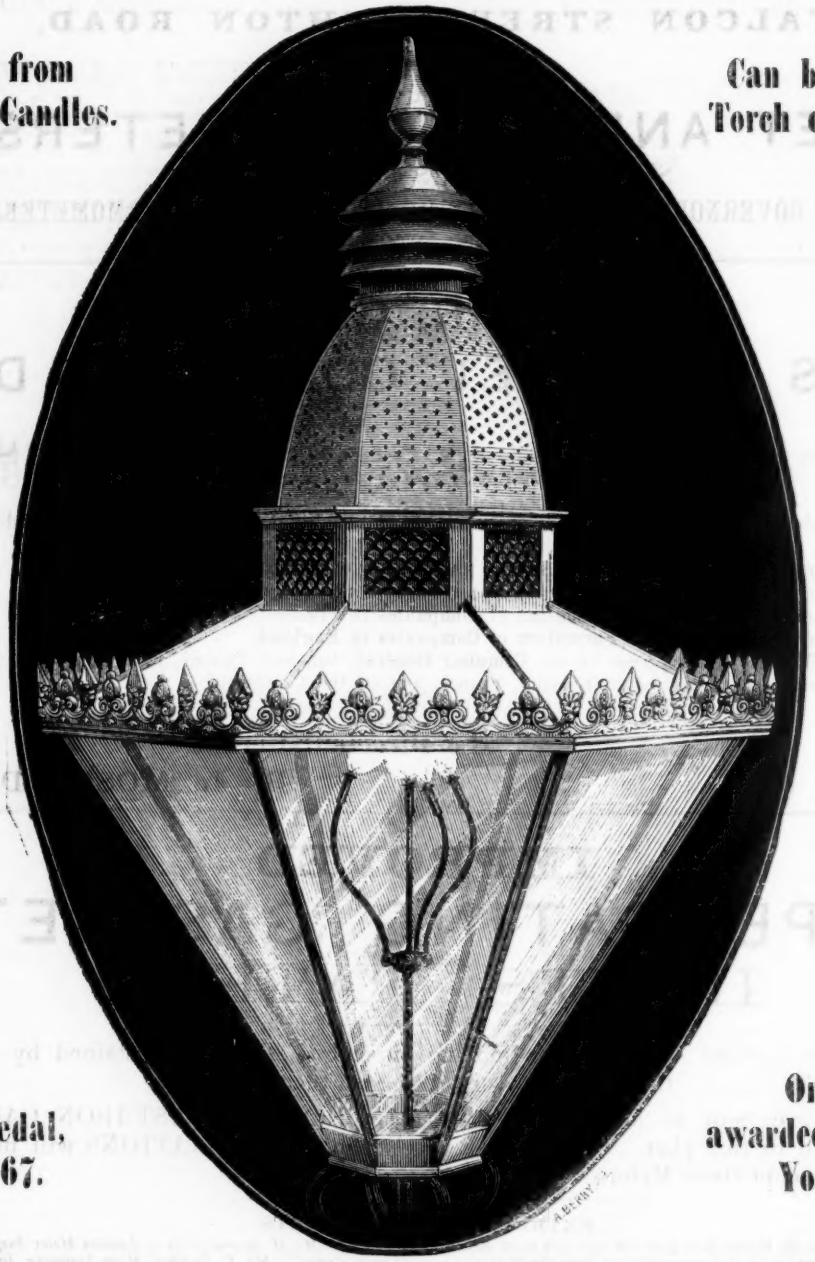
SYSTEM OF LIGHTING STREET REFUGES, &c.,

With Patent Shadowless Lanterns and Flat-Flame Burners of High Illuminating Power, suitable for Cannel or Common Gas.

THE "WESTMINSTER"

Sizes vary from 100 to 200 Candles.

Can be lighted by Torch or Centre Jet.



Two Gold Medals,

Paris, 1878.

CLASSES 13 & 31.

LONDON, 1862.

Two Gold Medals,

Paris, 1878.

CLASSES 13 & 31.

LONDON, 1862.

Bronze Medal, Paris, 1867.

Only Medal awarded for Burners, York, 1879.

PATENT FLAT-FLAME LANTERN,

(REGISTERED DESIGN,)

Made the following Powers of Light, 100, 150, and 200 Candles.

FOR PRICES AND PARTICULARS APPLY TO

WILLIAM SUGG, ENGINEER,

GRAND HOTEL BUILDING, CHARING CROSS, & VINCENT WORKS, WESTMINSTER,
And 12, Rue St. Roch, Paris.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

THE

LANCASHIRE GAS-METER COMPANY, LIMITED,

FALCON STREET, ASHTON ROAD,

OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

LAMP GOVERNORS & TAPS, PRESSURE-GAUGES, MAIN THERMOMETERS,

ETC., ETC.

COMPTOIR GÉNÉRAL D'USINES À GAZ ET CONDUITES D'EAUX.

Offices: 55, RUE CONDORCET, PARIS.

The Comptoir Général of Gas and Water Works is authorized by a leading Company to **Buy Gas and Water Works and Concessions.**

The Comptoir Général is established for the **Buying and Selling of Works and Concessions.**

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M. L. MOSER DULFUS, the Proprietor of the **Comptoir Général,** has had Twenty years experience in financial affairs, and has a large and influential connection in England, France, and on the Continent.

No Commission or Expenses whatever are charged unless success is secured.

Le Directeur-Gérant,

55, Rue Condorcet, Paris. **Bn. L. MOSER DULFUS.**

IMPROVED COMPENSATING GAS-METER. HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 29 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

June, 1880.

"SYSTEMATIC WATERING."

THE ordinary Wet Meter can only register correctly at one water-line, and varies at every other.

This fact is recognized in "Compensating" Meters, which are simply ordinary Meters with superadded contrivances, more or less complicated, to maintain as nearly as possible that one water-line at which alone correct registration can take place.

With the use of the ordinary Wet Meter comes anxiety that the "systematic watering" be carefully performed; but who can be assured of this in every case? And even if such assurance were possible, evaporation could not by any system of periodical watering be prevented.

The use of "Compensating" Meters does not get rid of this anxiety, but merely transfers it to the question of the reliability of various kinds of additional mechanism (very liable to get out of order), in which experience has abundantly proved no confidence can long be placed.

There is no room for any anxiety in using the Warner and Cowan Meter, because it registers with practically the same accuracy at all heights of the water-line; therefore, careless watering can never affect its registration, nor is there any extraneous mechanism to become deranged.

The Warner and Cowan Meter is as simple as the ordinary Wet Meter, its measuring-chamber being a metal cylinder of precisely the same construction, but with a smaller similar one forming part of it to prevent its discharging (at reduced water-levels, as ordinary meters do) more gas to the burners than the revolutions record on the index.

But beyond this, the Warner and Cowan Meter possesses the additional advantage of a greater range of water-line than the ordinary Wet Meter.

It has been shown that variation of the level can only be prevented by special additional arrangements and mechanism (all liable to go wrong), and that in the absence or failure of these contrivances, variation is sure to occur, and this the Sale of Gas Acts allow to the extent of 5 per cent.

But no such range of error is required (or is possible) in the Warner and Cowan Meter, changes of water-line neither affecting it nor requiring to be provided against. The range of float is therefore greater, and the necessity for watering less frequent, than in other Meters; and, when performed, is only for the purpose of keeping open the valve for the supply of gas, and has no practical effect on its measurement.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

CHURCH ST., MILLBANK ST., *LONDON, S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

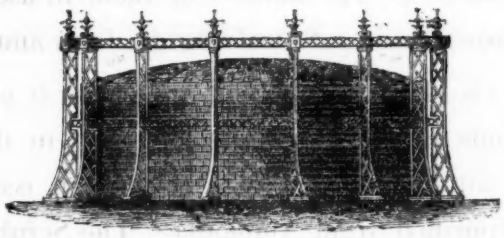
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

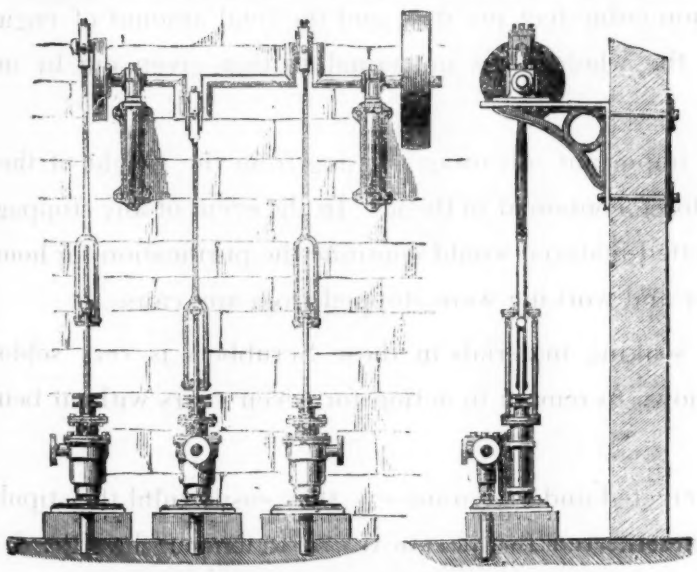
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

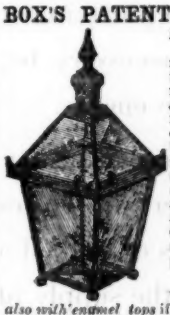
FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

BOX'S PATENT STREET GAS-LAMP



Has the following good qualities:—1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee,

Gas-Works, Crayford, Kent. W. W. BOX,

RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

Prices and Analyses on application.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analysed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of 16·67-candle gas, with 1430 lbs. of good Coke, per ton.* Ash in Coke, 1·85.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.
London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

THE
SILICA FIRE-BRICK CO.,
OUGHTIBRIDGE
Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

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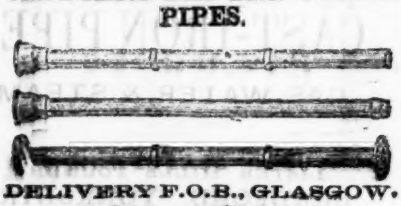
CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

FERRAND DAVIES,

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES.

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

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PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

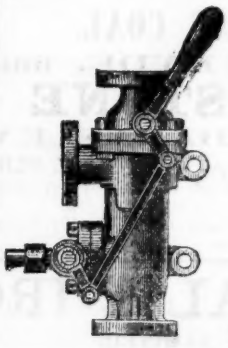
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.



KÖRTING'S UNIVERSAL INJECTOR,

ENTIRELY SELF-REGULATING.

LIFTS 26 FEET.

FEEDS WITH HOT OR COLD WATER.

WORKS WITH HIGH OR LOW STEAM PRESSURE.

Price Lists on application to

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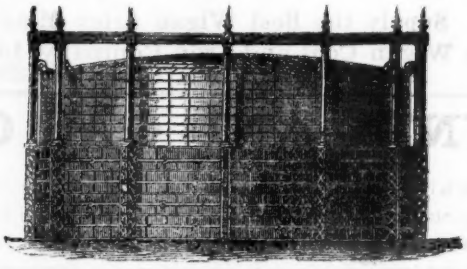


HENRY BALFOUR & CO.,

ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,

39, FINSBURY CIRCUS, LONDON, E.C.

Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.

MANUFACTURERS OF

GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.

BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES, GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.

ANDERSON'S PATENTED INVENTIONS, VIZ.—

FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.

H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

SHIPPING ORDERS receive special attention.

H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.

ESTIMATES AND DESIGNS ON APPLICATION.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

Limited,

Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

Quotations and full Analyses will be supplied on application addressed to the Company,

LOCHGELLY, FIFESHIRE, N.B.

Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
Plesio Boghead	13,165	....	36·16	....	1632
Brown Capledrae	12,210	....	38·46	....	1610

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise 2000 tons per day of REAL OLD SILKSTONE GAS COAL.

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

CANNEL AND GAS COALS.

THE DUKINFIELD COAL AND CANNEL COMPANY are prepared to deliver, to any Station, their Celebrated GAS COALS, which have a very high reputation for quantity of Gas and Illuminating Power, and make a First-class Coke.

Analyses and terms of delivery may be obtained by communicating with the above Company, at their Offices,

DUKINFIELD, NEAR MANCHESTER.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS. (INVENTED & PATENTED IN 1844,) PRIZE MEDALS.

LONDON, 1851; NEW YORK, 1853; PARIS, 1855. COMBINING ALL THE LATEST IMPROVEMENTS, LONDON, 1862; DUBLIN, 1865 PARIS, 1867.

MANUFACTURED ONLY BY

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

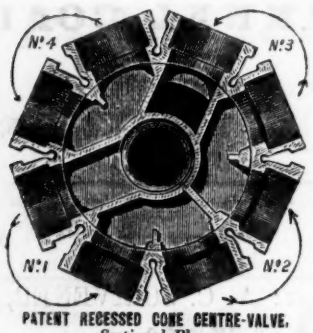
References and Testimonials.—We can furnish you with any number of these; and may mention that during the last thirty-five years we supplied most of the Gas-Works in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.



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Sectional Plan.

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THROUGH-WAY & FOUR-WAY COCKS

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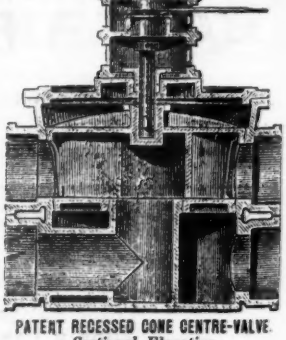
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PATENT STREET LAMPS,

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

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London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 10, 1880.